PROSPECTUS

— OF THE —

EAST TENNESSEE LAND

COMPANY.

CHARTERED MAY 25, 1889,

By the State of Tennessee.

NEW YORK, 1889.

THE SOUTH PUBLISHING COMPANY,

ENGRAVERS AND PRINTERS, 76 PARK PLACE, NEW YORK.

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FOUNDATION FACTS.

LANDS About 300,000 acres in all. At least nine-tenths valuable for farming purposes. A portion under improvement. All well watered. Climate the most healthful. Winters mild and short. Growing season long and temperate. Markets at easy command.

COAL Quantity inexhaustible. Underlies 250,000 acres. Quality most excellent. Bituminous, for Coking, Steam and Domestic use. Easily mined. Near to town sites. Accessible by two railroads now constructed, and within easy reach of many furnaces and cities.

IRON ORE At least 75,000,000 tons of Hematite, or Red, Limonite, or Brown, Magnetic, or Steel, covering thousands of acres. Quality demonstrated by actual use. Three mines now in profitable operation, with growing demand.

TIMBER At least 600,000,000 feet of Oak, Poplar, Pine, Chestnut, Hickory, Beech, Birch, Maple, Cherry, Ash, Cucumber, etc. Covering about four-fifths the entire acreage. Growing more valuable every year.

CITY SITE For Manufacturing; two Trunk Lines of **HARRIMAN** Junction Railway; on Navigable River. Iron Ore, Coking Coal and Limestone close at hand. Several new Railroads projected. A strategic point.

TOWN SITE Health Resort, on Uplands. Focus of Agricultural region. **DEERMONT** 2,000 feet above sea level; 12 miles northwest of Harriman, on Cincinnati Southern Railroad. Magnificent Scenery. The purest air. Delightful for Residence.

Cost of above, about $2,000,000; capitalization, $3,000,000, allowing $1,000,000 for Improvement Fund.

For full description of properties; details of policy, plans and purposes, see following pages.

PROPERTY OF THE EAST TENNESSEE LAND COMPANY.

PRELIMINARY.

"DOWN IN TENNESSEE."

THE term East Tennessee has been long a synonym for delightful climate, picturesque scenery, devoted patriotism, and great natural resources. Yet, notwithstanding this fact, the region which that term describes has been largely overlooked by Northern capital and immigration until within a short time. Men have gone farther South, have taken millions of money with them, and have established thriving industries, built cities and towns and added fortune to fortune, where the climatic conditions, the mineral supplies, the transportation facilities, and the agricultural environments did not approximate those of East Tennessee, while that magnificent field of opportunity has grown whiter and whiter for the harvest of enterprise, wisdom and sagacity sure to come. It is full ripe to-day. And to-day other men with other millions, and with foresight of the future matching their appreciation of what already exists, in a spirit of broad co-operative liberality rather than selfish monopolistic greed, and with a purpose to serve their fellow men and conserve the common good, have gone in "to possess the land."

THE EAST TENNESSEE LAND COMPANY

was a natural growth. Some such organization became necessary, for the development, over a wide and thinly settled area, of social conditions that should render possible the best business endeavors. In the order of nature those things necessary come to be. Gentlemen of unusual familiarity with the South were drawn to mutual consideration of East Tennessee, and to frequent, careful observation and inspection of its advantages. At first they contemplated little more than certain social alliances, through limited colonization, with a view to home establishment for themselves, in an atmosphere they had found healthful, amid scenery superb, upon a soil which would yield ample support. But their plans broadened. Other gentlemen were drawn to like interest with

them; the interest of all grew; and on the 25th of May last these gentlemen received a charter from the State of Tennessee, naming them as incorporators and first directors of the East Tennessee Land Company. On the 10th of June the Company's organization was perfected by election of the following

OFFICERS:

PRESIDENT—Clinton B. Fisk.
FIRST VICE-PRESIDENT—John Hopewell, Jr.
SECOND VICE-PRESIDENT AND MANAGER—Frederick Gates.
TREASURER—A. W. Wagnalls.
SECRETARY—A. A. Hopkins.

The names of these gentlemen, and their associates in the Board of Directors, will be widely recognized throughout this country, and the careful consideration which they have given to the Company's plans should insure equally wide-spread confidence, and guarantee for these pages attentive perusal.

A PROSPECTUS SHOULD

give, fairly and sincerely, the facts in the case. The statements detailed herein have been submitted to several unbiased observers, who acknowledge, after full investigation, that nothing is exaggerated. It is desired in this pamphlet to tell the truth, as fully as can be done in the space at command, considering the extent and scope of the enterprise, and as candidly as possible. A brief description of the Company's properties, only, can be given, followed by a general outline of plans and policy, with expert testimony, maps, and appended tables of analysis. To these the reader's attention is invited, especially if the reader has money to invest, or contemplates a change of residence, climate, or business.

PROPERTIES OF THE COMPANY.

GENERAL OUTLINE.

Three grand divisions comprise the territory known as East Tennessee,—the mountain region bordering upon North Carolina, celebrated in story by Craddock and other writers, and picturesque beyond all description; the Great Valley of the Tennessee, with its numerous parallel ridges forming a multitude of lesser valleys, and sweeping clear across the State from northeast to southwest; and the Cumberland Plateau, forming the western wall of this great valley, lifted an average of one thousand feet above it, and extending westward an average width of about fifty miles to the great Central Basin of the State.

The lands of the East Tennessee Company lie in each of these three divisions, but are situated mainly upon the Cumberland Plateau, famed far and wide for the healthfulness of its climate and the beauty of its scenery. They form the central portion of this plateau, drained by the Emory River and its tributaries, and comprise there 275,000 acres lying in the contiguous counties of Morgan, Cumberland, Fentress, White and Putnam. The face of the country is rolling, well wooded and admirably adapted to agriculture; and the entire region is underlaid with vast beds of bituminous coal.

In the valley, reaching from the foot of the Plateau, along both sides of the Emory River after it breaks through Emory Gap, and including one tract across the Tennessee farther down, are about twelve thousand acres, more or less under farm improvement, immensely valuable for their deposits of iron ore, and furnishing a most desirable location for a manufacturing town.

Near the North Carolina border, in Carter county, on both sides of the beautiful Wautauga Valley, are about 13,000 acres, in several different tracts, selected by the Company for their valuable timber and minerals, especially Bessemer iron ore, found nowhere else in such quantities within the State.

IRON ORES AND MINES.

BESSEMER OR MAGNETIC ORES.

Chiefly the ores thus far discovered in the South, suitable for steel making by the Bessemer process, are in the Carter county region. Just across the North Carolina boundary, within seven or eight miles of the East Tennessee Company's tract, are the well-known Cranberry mines, for which a fabulous sum was recently offered and refused, and from which immense quantities of Bessemer ore have been shipped. Until the East Tennessee Land Company's purchase and developments, these mines were supposed to be the central deposit of their kind, surpassing in quality and extent every other known, but the openings which this Company has made reveal deposits not less extensive, of a character pronounced equal if not superior, and in position to be more easily mined. At slight expense many tons of the purest and best grade ore have been taken out and thousands of tons exposed. Competent witnesses declare that this Wautauga property is the richest and most valuable for steel-making purposes yet discovered. It lies within five miles of the East Tennessee and Western North Carolina Railroad, and within two miles of the proposed line of road from Bristol to Asheville, building of which is announced as soon to begin by the Norfolk and Western Railway Company.

This ore deposit is in form of a stratified bed, outcropping three-fifths of the way up May's Ridge, and extending along it three and a half miles upon this Company's land. It dips into the Ridge or mountain at an angle of 35 degrees, and is believed to reach clear through this ridge and into the base of the ridge beyond. The ore-bearing strata have a thickness of 300 feet, and a conservative estimate would put the ore therein at not less than 100,000,000 tons. Cranberry ore is being sold at the mines to-day for over $2.00 per ton. Allowing the cost of mining to be fifty cents per ton, the value of this deposit can be more quickly computed than comprehended.

Great preparations are making, within twenty-five miles, to establish furnaces for the reduction of Bessemer ores, and local market for a large part of this mine's output is thus assured at an early day. Its distance from the new city of Harriman, particulars of which are given farther on, is about 170 miles, where furnaces are contemplated specially for reducing its ore, that so this company may gain profit from both the supply and the demand.

The Union Camp Mining Company has been chartered for the purpose of operating these mines of the East Tennessee corporation,

PROPERTY OF THE EAST TENNESSEE LAND COMPANY.

and of its capital stock of $1,000,000 the East Tennessee Land Company has controlling share, paying therefor in a lease of the mining property. It is believed that the East Tennessee Land Company's portion of the Mining Company's profits will soon be sufficient to cover a handsome dividend upon this Company's entire capital.

It is difficult for the average reader to appreciate the vast value of this one small part of the Company's domain. The *ne plus ultra* in mining, to the average man, is a gold mine. Men will ignore an iron mine, to dig for the yellow metal; but the hard facts are that the average iron mine is ten times more certain to pay a profit than the average gold mine, and the average profit of the iron mine is much greater. This shows how far from truth popular conception may be.

The explorations and development of the above Bessemer ores are still going on, with growing probability that if all the other properties of the East Tennessee Land Company were given away, this one immense deposit would insure large returns to the stockholders.

RED HEMATITE ORES.

Most of the red fossiliferous ores of Tennessee lie in the lesser ridges which parallel the east wall of the Cumberland Plateau. These ridges, containing these ores, lift from one hundred to five hundred feet above drainage level. In the Emory valley, after that river makes through Emory Gap, and eastward after the Emory swings away south to join the Clinch, the veins of ore are vertical, or nearly so, and there are usually three in each ridge, varying in width from eighteen inches to three feet, and ranging from twelve to forty feet apart. Being stratified veins, their depth may never be found, but that they reach far below the base of every ridge is well established, and that they incline far under the plateau is more than probable.

These veins extend eight miles, upon the lands of this company, beginning at Harriman, and have been opened at several points with uniform development. The ore in them is of exceptional quality, as appended analyses will show, and from it excellent high-grade iron has been produced. The opinion of Dr. Koenig, Professor of Metallurgy in the University of Pennsylvania, who made careful examination of them and their locality, affords all the testimony as to their value and accessibleness which could be asked. In this opinion (see appended reports) Dr. Safford, State Geologist of Tennessee, emphatically coincides, likewise Mr. J. C. Guild, Assistant State Geologist.

The ease with which these red ores can be mined, (because of their great lift), their high grade and their unusual fluxing character, the presence of abundant limestone in the same ridges, and the nearness of the whole exceptional deposit to the new City of Harriman, hereinafter described, render it probable that iron can be made from them at less cost than anywhere else yet found. They were opened some years ago on their eastern limit, and a small furnace was then established there, four miles from the Emory and two or three times that distance from any railroad. The company operating it had small working capital, and expended this in building a railroad of their own, got into financial straits and failed. But they demonstrated what these ores are worth, and now the Cincinnati Southern at one end of the deposit, and the East Tennessee, Virginia and Georgia keeping close parallel with and within stone's throw of it for eight miles, offer all the railway facilities needed, and have provided for the new Harriman Coal and Iron Company, leasing from the East Tennessee Land Company, an outlet, ready at hand, for one of the finest bodies of red fossiliferous ore anywhere to be had.

TENNESSEE RIVER MINES.

Southeast of this, and to the south of Kingston, twelve miles from Harriman, is a body of red hematite more remarkable yet. This

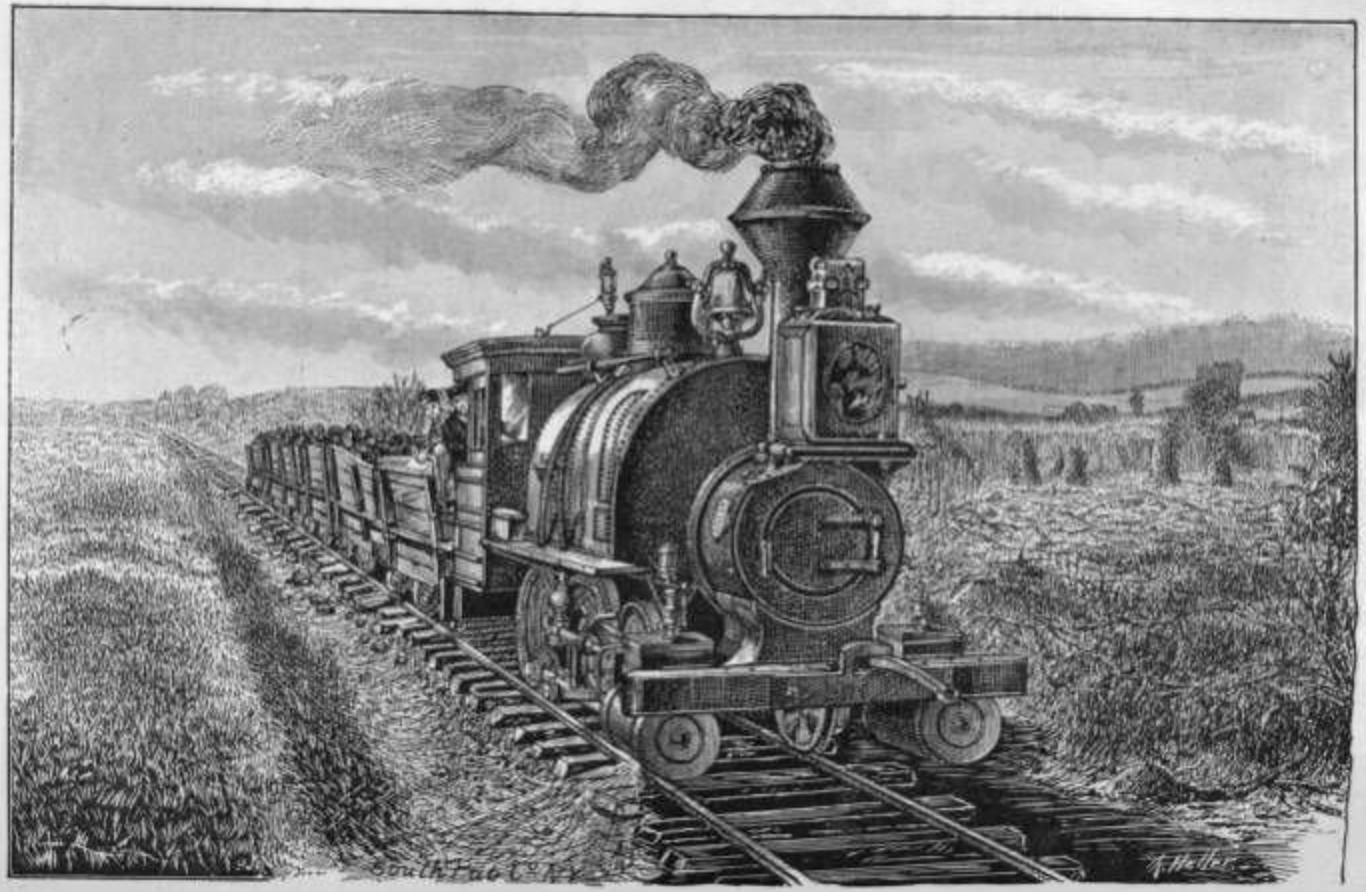
underlies two or three ridges which parallel the Tennessee River east of it, and is *a genuine ore bed* rather than a series of ore veins. In thickness it varies from six feet upwards; its width averages half a mile, and it is fully six miles long. It lies near the surface generally, having as a rule not more that six feet of soil and shale above it, and is taken out mainly by the process well known to miners as stripping.

It slopes with one ridge down to the narrow valley at the base thereof, sweeps across that, and thence ascends the ridge parallel, lifting in that, finally, to a vertical position. Through part of its length a third ridge is found, separating these two, and where this appears the ore bed sweeps clean under it, from one narrow valley to the twin valley beyond.

The ablest experts declare that this deposit is phenomenal. It contains both hard and soft ore—the soft predominating, and of quality most excellent, as appended analyses will show. A conservative estimate puts the quantity at not less than 40,000,000 tons. Eighty thousand tons were taken out of it last year from the Eureka and the Hackler Gap mines, views of which are given herewith, at an average cost for mining of forty-seven cents per ton. The ore has sold readily, delivered at Dayton and other points down the Tennessee, for an average of $1.68, yielding a net profit of at least fifty cents. A third mine has just been opened on the property—the Round Island—and the Harriman Coal and Iron Company, into whose management the whole passes December 1st, expect an output of at least 150,000 tons per year. This is easily put upon barges on the Tennessee River, and carried South or North. With the establishment of furnaces at Harriman it will all be required there, and there it can be delivered more cheaply, by water, than at any point where hitherto it has found a market.

About 1,000 acres of this deposit are owned in fee by the East Tennessee Company, and about 1,500 acres are leased for a term of years. The property has been under development five years, but most of the output thus far has come from the leased lands. Its purchase, added to that previously described, gave this company the largest holdings of red fossiliferous ore north of Birmingham, and the combined properties guarantee for Harriman a greater supply of Hematite than the furnaces of both Birmingham and Bessemer could exhaust throughout their lifetime.

All the equipment, personal property, etc., pertaining to the three mines now open, with the houses and commissaries, and six miles of railroad, were purchased by this Company, and are leased to



AN IRON ORE TRAIN FROM EUREKA MINES.—RAILROAD, EQUIPMENT AND MINES THE PROPERTY OF THE EAST TENNESSEE LAND COMPANY.

the Harriman Company, in which this Company holds controlling interest.

COAL.

Geologists affirm that the coal fields of Tennessee extend under the entire Cumberland Plateau, their "measures" reaching a depth of two thousand feet from the highest altitude. Coal is found nowhere else in the State. Under the Plateau veins occur at intervals of from fifty to two hundred feet, vertically, and the best of them may be entered above drainage level; indeed, the very best crop out nearest the Plateau's surface.

It is an admitted fact that the quality of these veins averages better in the central counties of the Plateau than in the counties farther south; indeed, the coal mines of Tennessee which have grown famous for general purposes are found in that section. For coking purposes

THE SEWANEE VEIN

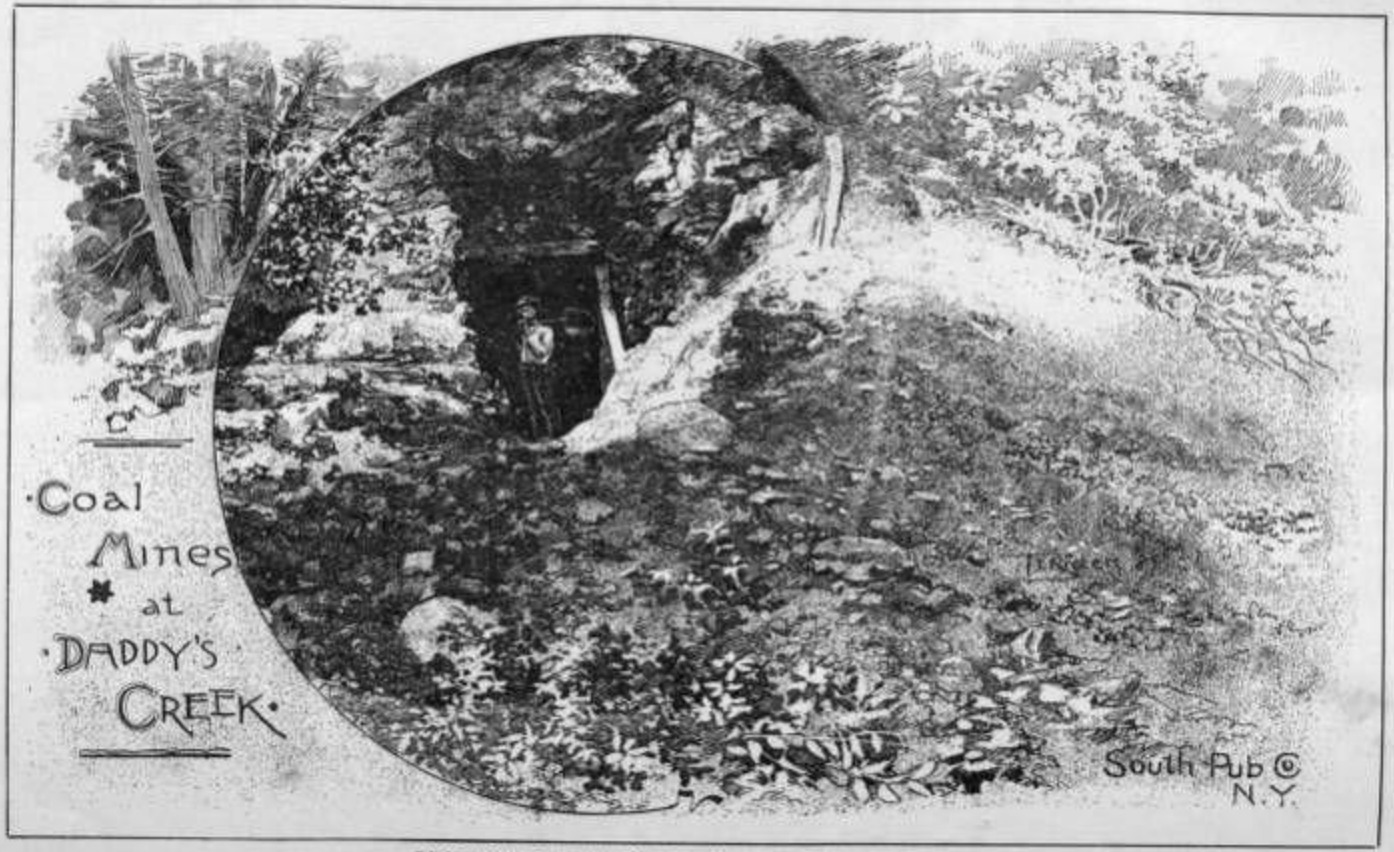
outranks all the rest. It is uniformly the thickest, most reliable coal vein which traverses the State. This vein occurs only in the upper coal measures, and because these disappear in certain localities it is not found everywhere on the Plateau. Where it exists, and where it can be easily reached, its value is almost incalculable.

The Sewanee vein, geologists report, *underlies many thousand acres of this Company's property.* It crops out vertically in the fault at the mouth of Emory Gap, and has been traced reliably at least six miles to the Little Emory, along Walden's Ridge, varying in thickness from four to eight feet. Its presence here, in sight and touch of Harriman's furnaces, is an advantage greater than can be described. It insures to Harriman an unfailing supply of the finest coke right at the furnace doors. It means great profit for the East Tennessee Land Company from this one development of it alone.

The Sewanee vein exists further west, there is every reason to believe, but has not yet been identified there with positiveness. Further explorations are in progress, and these will reveal it beyond question in the neighborhood of, if not actually in, Crab Orchard Mountain, among the highest points which the lands of this Company attain.

ON DADDY'S CREEK,

a considerable tributary of the Obed, which is the real Emory above the confluence of these two streams, a six-feet vein has been opened that may prove to be the Sewanee itself. Locally it has been known a long time, from its outcrop under a ford much frequented, and it has



PROPERTY OF THE EAST TENNESSEE LAND COMPANY.

been made use of in local forges often with satisfaction. It is bright, hard and handsome, and from it coke has been made, in a coke oven with seventy-two hours burning, pronounced equal to the Pocahontas or Connellsville for carbon percentage and burden-bearing quality. See analyses.

Other veins, excellent for coking, have been opened at many different points upon this Company's territory west of the Emory River, sufficient in number and extent, and sufficiently well traced, to demonstrate an enormous supply of coking coal in that portion alone.

As for

DOMESTIC COALS,

the best of them are found in that section of the Plateau lying east of the Emory, in the upper coal measures, geologically even higher than the Sewanee vein. These extreme upper measures are not known to exist farther south and west. They embody the celebrated Glen Mary and Poplar Creek mines, and the eastern coal lands of this Company are situated between these two, comprising an area of about 20,000 acres. The peculiar excellence of these coals for domestic purposes is widely recognized. These veins run from eighteen inches to eight feet in thickness, and are at least five in number, affording in the above area a supply practically inexhaustible.

In addition to this large acreage of Domestic coal east of the Emory, the Company has at least 20,000 acres in the same section underlaid by coal similar to that of the western section previously mentioned, making a grand total of coal property aggregating 275,000 acres! It is believed that the coal possessions of this Company surpass in area those of any other single similar company on the Continent. On an accepted estimate that a four-feet vein is *actually worth* $25 per acre, and granting that the workable thickness of all the veins in above territory covers less than twelve feet, their total value to-day would reach $20,000,000; and such property is yearly appreciating. The figures at which this Company made its purchases will never again be conceded by owners of coal lands. Without one stroke of development the natural increase of its coal properties would bring to this Company several times their cost in a very few years, if sale were desirable. Developed and operated as hereinafter set forth, they will yield enormous annual revenue for generations.

AGRICULTURAL LANDS.

The farming lands of this Company lie chiefly on the Plateau, and comprise about 250,000 acres. Their rolling surface insures good drainage, and frequent rain-fall defends against drought. The

is unusually inviting, and most of it is virgin to the plow, being well covered with valuable timber. Long reaches of it, with their gentle, wooded undulations, so free of underbrush that the horseman can ride over them without hindrance, resemble familiar pictures of the famous English parks.

Nine-tenths of the surface is arable, and on it native grasses flourish and afford good grazing, even where timber most abounds. Frequent springs and streams furnish abundant water supply for man and beast, and of quality unsurpassed.

THE SOIL

varies from a sandy to a clay loam, with clay subsoil prevailing, underlaid by sandstone formation. It is not liable to wash, like many of the Southern soils. It is naturally of good quality, strong and retentive, but is not deep, the leaves and other vegetable accumulations having been burned off year after year, for generations, first by the Indians, the better to secure their game, and since by the scattered settlers, in order that grazing might earlier begin. The turning under of clover, peas, or other green crops, would supply this lack, and bring the soil into excellent condition for crops of almost every kind. Even without this, and with scarcely any fertilization or cultivation, the native farmers raise from fifteen to forty bushels of shelled corn to the acre, and proportionate crops of rye, oats, potatoes, etc. They have generally known little about farming, and have cared as little to learn, being satisfied with meager subsistence on corn bread and bacon, with plenty of leisure to hunt and fish. The few more ambitious and industrious have fairly demonstrated what could be done.

FAVORABLE SEASONS

conduce to the farmer's advantage in uncommon degree. The winters are short, and so mild that plowing can be carried on nearly the whole time. Spring comes early, and the growing season is so long that two, or even three, crops can be taken off the same land in one year. Potatoes are planted in March and corn in April. Autumnal frost usually delays a month later than in New York. The heat of midsummer is not debilitating, the temperature rising no higher than in central New York State, and the pure, bracing atmosphere of the Plateau making outdoor labor a luxury. The annual mean temperature of this region is recorded as fifty-eight degrees, with a maximum of about ninety-seven degrees and a minimum of ten degrees.

CROPS, ETC.

Of grains, corn, oats, rye, wheat, buckwheat, sorghum and millet can all be grown, with a good yield.

Of grasses, clover and red top grow finely, making a good catch, as do also timothy, orchard grass and blue grass where proper care is given them.

Of fruits, apples, pears, peaches, plums. grapes, cherries and berries are all successfully raised. It is the best apple country in the South. Grapes, wild and cultivated, grow thriftily and yield well, likewise all kinds of berries, and currants. For the cultivation of small fruits this region will at an early day become famous.

Of vegetables, the potato, Irish and sweet, cabbage, tomato, melon, peas, beans, onions, celery, and in fact all kinds, grow splendidly.

Of flowers, this territory is prolific. The woods are bright with them, from March until November; and to their wild beauty domestic varieties can be added indefinitely.

STOCK-RAISING.

This is naturally a grazing country. Thousands of cattle feed upon the wild grasses of the Plateau, and fatten for city markets. They can graze with profit ten months in the year; some farmers keep them out all winter. Horses, mules and swine can likewise be profitably raised and kept here. "There is no finer country for sheep-raising and wool-growing in the world;" so says a noted expert.

MARKETS,

for a large part of the territory, are even now at easy command. Small fruit can be picked from thousands of acres on the afternoon of one day, and put upon the market stands of Cincinnati the morning of the next, by the Cincinnati Southern Railroad;—in a small way, this is already done. It will find an increasing demand in Knoxville, Chattanooga and Atlanta, where certain of the small fruits are but just being appreciated, and nearer which they are not extensively grown. Nashville will ere long be in direct railway communication, and afford another outlet; while these and other Southern cities, rapidly growing in size, must call for all the produce which can be spared from the Plateau, not to mention the nearer needs of Harriman and Deermont when the population of these new towns has multiplied to many thousand, and made a local market equal to markets more remote. The acreage now farthest from railroad accessibility will be brought near by the new lines projected, and thus all parts of the territory will come in touch with market demands. Well-made highways, for which there is ample and excellent material—unusual in the

South—will aid the farmer's convenience, and render marketing easier than generally it is in the South or West.

TIMBER.

This Company has purchased no lands for their timber alone, but the lands it has purchased, when once colonized, are worth for their timber all they cost this Company. Many thousands of acres have been cleared, and from other thousands part of the timber has been cut; but far the larger portion is covered by primeval growth, becoming every year more valuable.

OF YELLOW POPLAR

(*Lyriodendrum tulipifira*), known in the Northern markets as whitewood, one estimate of experts puts the amount upon the Carter County tracts at 10,000 feet per acre, or more than 100,000,000 feet all told. There is much of this timber, beside, upon the Plateau lands; and yellow poplar has come into extended use for fine interior building finish, for furniture work and the like, and brings from $30 to $35 per thousand at wholesale in the North.

SEVERAL VARIETIES OF OAK

are found in both the Wautauga and the Plateau districts, and aggregate more millions of stumpage than any other one kind of timber affords. They include the White (*Quercus alba*), the Red (*Quercus rubra*), the Black (*Quercus tinctoria*), the Chestnut oak (*Quercus prinus palustris*), the Post oak (*Quercus obtusiloba*), the Water oak (*Quercus aquatica*), the Turkey oak (*Quercus cerris*), and the Spanish oak (*Quercus falcata*). All these can be utilized, and will be in demand for the manufacture of wagons, agricultural implements, fine office and household furniture, cooperage, etc.

OTHER HARD WOODS

include White (*Juglans tomentosa*). Shell bark (*Carya alba*) and Red Hickory, much used for spokes, handles, etc., Chestnut (*Castanea vesca*), Walnut (*Juglans nigra*), Beech (*Fagus sylvatica*), Butternut (*Juglans cathartica*), Black and Sweet Gum (*Liquidambra styraceflua*), Black Birch (*Betula lenta*), Hard and soft Maple (*Acer rubrum*), Ash (*Flaxinus Americana*), Cherry (*Prunus cerasus*) and Holly (*Ilex aquifolium*), besides a few others of lesser value.

THE SOFT WOODS

are White Pine (*Pinus strobus*), Yellow Pine (*Pinus mitis*), and Black Pine (*Pinus austriaca*); Hemlock (*Abies canadensis*), Cucumber (*Magnolia acuminata*), Basswood (*Tilia Americana*) and Cedar (*Cumpressus*

throides). While the pines do not cover a large proportion of territory, to the exclusion of hard woods, their aggregate feet of stumpage is quite large and their value important.

No exact estimate of the timber owned by this Company has been made, or is cared for, since the intention is that the bulk of it will go with the farm lands when sold, and that a good portion shall be preserved in the interest of future generations; but a very conservative approximate calculation places the total at 600,000,000 feet. The probability is that a round billion feet of timber will not exceed the amount now standing upon the Company's 300,000 acres.

MISCELLANEOUS.

Beside the minerals heretofore mentioned, manganese and brown iron ore (or Limonite) have been discovered in considerable quantities, the extent and quality of which are yet undetermined, but will soon be ascertained and made known.

Limestone, both for building, burning and furnace purposes, exists in abundance. Other building stone abounds, easily quarried and of good quality.

Clay suitable for brick-making is found at and near Harriman in quantities ample for all time. Fire-clay and pipe-clay both occur in different localities, a full explanation and report of which will be forthcoming later.

There are reasons for believing that the oil belt of the North reaches far enough southwards to include the coal region of Tennessee. The geological formation under a part of this Company's territory justifies an opinion that natural gas may be developed whenever it shall be sought. However, the Company places no dependence or value whatever on these possibilities.

Of available water-power privileges along the Emory River and its chief tributaries, there are not less than seventy-five miles, which can be utilized for nearly all kinds of manufacture. The fall of the Emory River in a distance of thirteen miles is 400 feet, and should the transmission of power by electricity prove practicable, all the accumulation of energy by this great extent of rapidly running water can be centered at Harriman, giving an advantage to that place such as few cities enjoy.

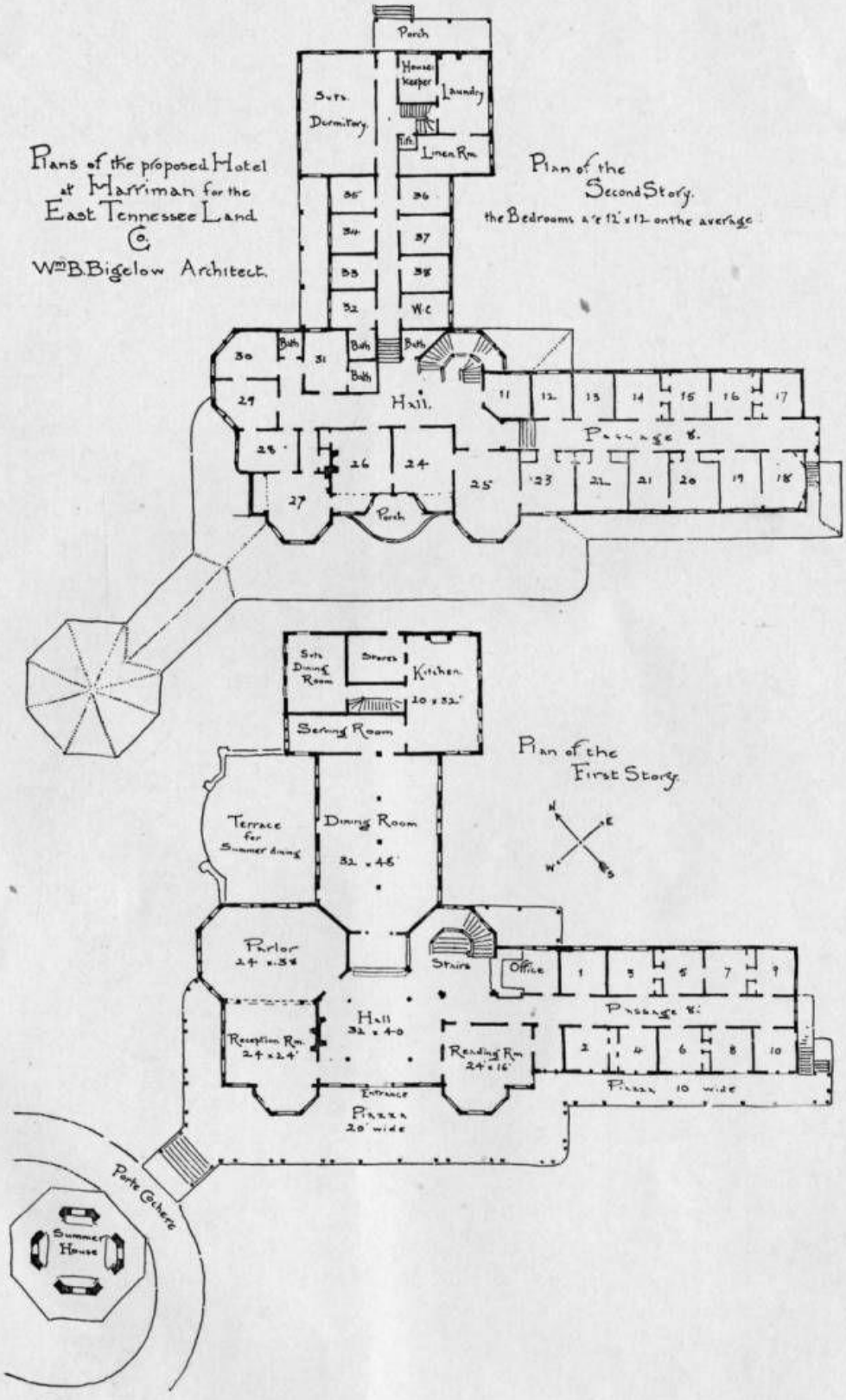
A number of chalybeate and sulphur springs are locally esteemed at various points on the property, one quite near to Deermont, but no critical examination or analysis has been made thereof.

Proposed Motel
at Harriman for the
East Tennessee Land Co.

Wm B Bigelow
Architect
52 Broadway New York City

Plans of the proposed Hotel at Harriman for the East Tennessee Land Co.

Wm B. Bigelow Architect.



Plan of the Second Story.

the Bedrooms are 12' x 12' on the average

Plan of the First Story

PLANS AND POLICY OF THE COMPANY.

Briefly these may be stated thus:

To sell 250,000 acres of farming land, reserving all mineral rights.

To do this by systematic colonization.

To establish a manufacturing city, at a strategic valley point.

To establish an upland town, as a health resort and an agricultural outlet.

To sell 3,000 acres of land in town and city lots.

To develop 250,000 acres of coal and iron deposits.

To do this through subordinate companies, organized under supervision of the parent Company, in which this Company shall hold controlling interest, such interest being secured without cash payment.

To secure from such interest in these companies, and from the royalties they will pay, a large and perpetual revenue.

With such an immense area of possessions as has been briefly described, and such diversity of the same, there must be one or more centers of effort, and a plan of operation properly focalizing itself at one or more central points. The East Tennessee Company will not expend its energies and its working capital in mining or manufacture, nor in any miscellaneous fashion distributed over such broad territory. It is, what its name indicates, a *Land* Company, and having acquired magnificent heritage in lands, its one purpose is to turn these, by systematic development, to the best advantage possible.

To this end it has organized, and will organize, other companies, with abundant capital drawn from its own individual membership and from investors outside, and to these subordinate companies it will transfer by lease the timber upon its lands, or the excess thereof beyond the need of settlers, and the minerals under them, devoting itself to surface development and improvement. All of its arable acreage will be offered for sale, mineral rights being reserved, and will be set off in holdings of varied size, suitable for town lots, for truck farms, fruit gardens, mixed farming, sheep husbandry, cattle raising, etc. To render these available good roads will be constructed at proper inter-

vals—something hitherto generally unknown in that section,—the streams will be bridged, and the necessities and comforts of a farming country—mills, blacksmith-shops, post-offices, churches and schools—will be fitly provided for. To its broad purposes

OF COLONIZATION

two trunk lines of railway will at once contribute—the Cincinnati Southern and the East Tennessee, Virginia and Georgia, and also the growing dissatisfaction of Northern people with Northern winters.

From the North and Northwest farmers and others are looking to the Middle South in great numbers, and immigration thither has year by year increased, under conditions never the most favorable hitherto. This company will take steps to secure low rates of travel, to make widely known the advantages East Tennessee affords, to organize excursion parties, and to present freely and honestly the general facts. Its agents will seek for colonists where they are most likely to be found, and will arrange to take them to this Company's lands in parties of convenient size, and to locate them desirably when there.

There seems no reason why 200,000 acres of farming, fruit, cattle and sheep lands may not be sold by this Company within the next three years, at an average price of ten to fifteen dollars per acre, and on terms that shall greatly benefit every colonist. With Chattanooga, Knoxville, Nashville, Cincinnati and Louisville within from two to twelve hours, by rail, from the territory it is intended to colonize, good markets are assured and fair returns for intelligent effort need not fail.

PECULIAR CONDITIONS.

East Tennessee is better suited to Northern immigration than any other portion of the South. Its present population were largely loyal during the war, and the work of reconstruction, beginning earliest among them, has there proceeded without interruption and with the best results. New social conditions can there be established more easily than elsewhere over any Southern area of like size. No sectional prejudices there exist which need to be overcome, and all the vast extent of this Company's farming territory is as open to the planting of Northern ideas, customs and methods as ever were Dakota and Nebraska. This is a strong point to make with men who want cheap lands within a milder latitude than the States named. And it is not probable, one might say it is not possible, that so extensive an area will ever again be secured by one Company, in a body so

compact, under conditions of climate and soil so desirable, inside the limits of the United States.

But while so large a proportion of the East Tennessee Company's territory can be sold for agricultural purposes, and at handsome profit—profit enough, as is believed, to return all the investment originally made—the Company expects to reap its chief gains, after those realized from coal and iron interests, from its work

OF TOWN-BUILDING.

No one familiar with the history of successful new towns need be told how ample the returns are from their establishment. The selling of city lots, where growth is rapid and where great industries congregate, is more productive of wealth than a gold mine. A dozen lusty young cities in the South might be named in proof of this, and these have but anticipated the great current of immigration from the North now fairly setting in.

"But," it may be said, "are there not new towns enough, and is not town-building being overdone?"

That depends upon the town and its location. Locate your town where railroads are, or are bound to be, and where minerals are abundant close at hand, and you may build as many such as you please during the next decade without overdoing it. "The South is going to make the iron of this country for the next fifty years." So declared recently an iron manufacturer of the North. So believe the most sagacious men who have studied the iron problem North and South. Grant that they are right, and the wisdom of prudent town-building is granted as well. For iron will be made where it can be made cheapest; it can be made cheapest where iron-plants have place in close proximity to the iron mines, and where coal supplies exist in the same neighborhood. To establish furnaces, coke ovens and iron-works, and to open coal beds at any given point, is to create a town. You may create a town at each of one hundred *such* points in the South—supposing so many are found—and the iron production will not exceed the demand. The South has cheapened iron production by disclosing coal and ore in closer proximity than anywhere known in the North. Transportation of the raw material enhances cost of the product therefrom. Bring coal and iron ore together at the minimum of transportation, and you will manufacture iron at the minimum of cost, always provided your ore is of the proper kind, and your coal of good coking quality.

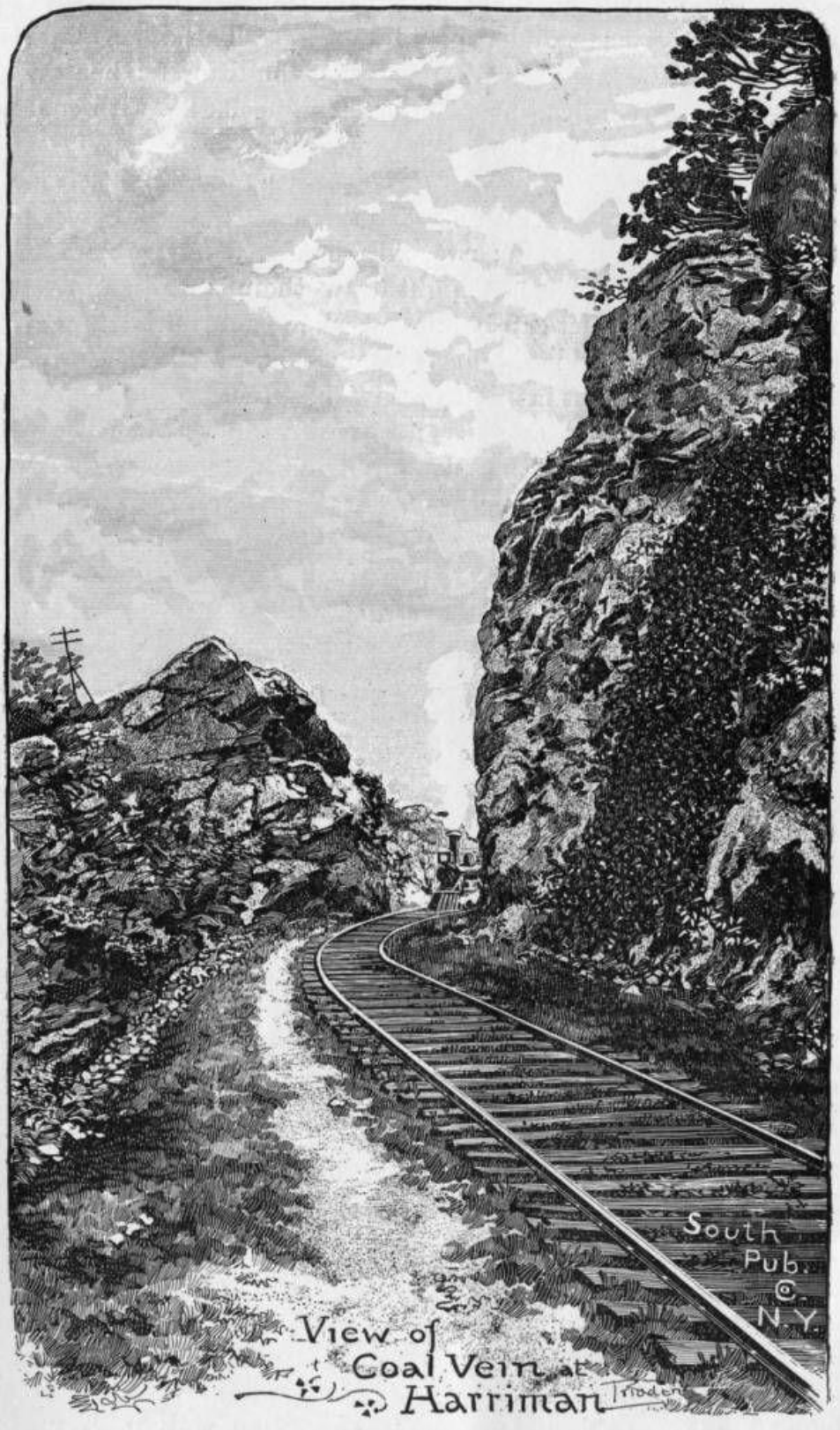
Considerations like these determined the East Tennessee Land Company to establish the

CITY OF HARRIMAN.

It was known that shrewd iron-makers were in search of the ideal site for iron-making. It was believed that this ideal site lay just outside the mouth of Emory Gap, on both banks of the Emory River, at the junction of the Cincinnati Southern and the East Tennessee, Virginia and Georgia railways. Coal was known to exist in Walden's Ridge,—which there bends northeast from its northerly course and takes a crescent shape, almost half encircling the site; and iron ore was an accepted fact in the lesser ridges parallel, with limestone in rifle-shot of each. To these near sources of raw supply, waiting at the proposed new city's very doors, might be added those of the marvelous iron deposits heretofore described in these pages, but ten or twelve miles away, and of the inexhaustible coal beds up the Emory and its tributaries, and underlying all this Company's broad possessions upon the Cumberland Plateau, as has been also shown on pages previous.

About 10,000 acres of bottom and ridge lands were bought, after being passed upon by one of the Company's experts, and a part of these form the site of Harriman, named in memory of General Walter Harriman, late Governor of New Hampshire, who marched across the Cumberland mountains in 1864, with re-inforcements for Burnside, then operating against Longstreet in East Tennessee, and whose son, Walter C. Harriman, is one of the Company's Directors. This site has been surveyed, and topographically mapped, and will be fully laid out and improved as fast as possible. A Hotel Company has been formed, for erecting upon it a fine hotel, for which its location alone will insure patronage, from the start.

Harriman is eighty miles from Chattanooga, via the Cincinnati Southern Railroad, north, and fifty miles from Knoxville. via the East Tennessee, Virginia and Georgia Railroad, due west. Several hundred acres of it are a level plain, long under farm improvement, high enough above high water to avoid freshets, and spacious enough for all the furnace sites, business streets, etc., which may find location there. Through this courses the Emory, navigable to this point from its junction with the Clinch, a few miles below, and up which, from the broad Tennessee, twelve miles distant, were brought the materials for that massive iron bridge across it, over which the Cincinnati Southern Railroad trains move southward bound as they emerge from Emory Gap. Overlooking the level bottom lands are gentle ridges, lifting to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View of Coal Vein at Harriman

more commanding heights, along which thousands of homes may find pure air, perfect drainage, and a splendid outlook. The site is ample for a population of 50,000, with every necessary condition for health, and may be extended five miles down the river, if needs be, with coal and iron within a mile or two of it all the way.

It occupies *a more naturally strategic position than any other new or proposed city of the South.* Not only has it iron, coal, brick clay, building stone, etc., at its very side; not only has it a navigable stream, from which a hundred furnaces might draw their water supply, and down which their product can be floated when such outlet is wished; not only can timber be floated down from the near forests above, and afford supply, in cheapest fashion, for saw-mills and furniture factories and other wood-working concerns; not only does this river make possible the purest water supply for drinking purposes, and the cheapest electrical power for lighting, street railways, etc., to be had; but, more than all this, *Harriman is the open and the only gateway through which railroads can successfully reach the high level of the great Cumberland Plateau,* or descend therefrom, and so cross the State from east to west or west to east. It is the most natural railroad center in Tennessee.

Already two roads are completed through it, and two more have been surveyed through it, one of the latter being a direct line from Knoxville to Nashville. A fourth is projected from Harriman to Nashville, and a fifth to Knoxville from Harriman, while a sixth is proposed southward from Harriman to Kingston and points farther south, with others radiating from this to Augusta, Chattanooga, etc. Two roads now in process of building have nearly or quite reached the Plateau, on the west, heading eastward, and should naturally seek a trunk outlet eastward, which they can reach best at Harriman. The railroads now built and building and projected, would make Harriman grow like the lustiest young town in all the West, were there no mineral interests to give it impetus and growth. And these railroads must bring to it a wealth of timber, of produce, of iron and of coal soon rivaling the resources of any long-established town, and splendidly supplementing what Harriman will itself produce.

A Construction Company has been organized, with authorized capital of half a million dollars, which proposes to build one or more of the foregoing projected roads, and has already obtained much right of way.

The Harriman Coal and Iron Co. has been organized for operating all the coal and iron veins close about Harriman, and the Tennessee

River mines, near by; capital $1,000,000. This Company will open the noted Sewanee coal vein, almost within the city limits, which is described in appended reports of Dr. Safford and Prof. Koenig, and will supply furnaces to be erected as near the city as may be deemed wise by its management.

If the judgment of these experts is correct, and the openings are made through the iron veins into the vein of coal, in accordance with their advice, from the mouth of the same tunnel, and in close proximity to the furnaces, there shall issue hematite ore, and coking coal for its reduction, both of superior quality. It is believed that such an extraordinary combination of resources does not exist in any other iron-producing town. Harriman is eighty miles nearer the Northern iron markets than Chattanooga, and over 200 nearer than Birmingham, giving it an advantage in freight rates which every iron manufacturer will appreciate. The Southern demand for coke vastly exceeds the local supply, and a large percentage used at Southern furnaces is brought from Pennsylvania and West Virginia. This expense of importation Harriman will be saved, and its iron product proportionally cheapened, by reason of its own unlimited supply of coking coal, mined at its furnace doors.

The mining companies lease from the parent Company, which retains a controlling interest in each of them, and which, through the additional capital brought in by them and others, will be thereby immensely strengthened and profited.

In addition to its direct share of their profits, and to its own direct profit through the sale of lots which they will insure, the East Tennessee Land Company will hold most of the stock in the Harriman Light, Water and Power Companies, to supply the town with light, and water, and power—combined capital $500,000, and in any Street Railway Company that may be organized later on. The fixed policy of this Company, in town-building, is to establish all original town improvements—to lay the sewers, the sidewalks and the paving, to put in the water-works, and the lighting system, and the street car system —and then to operate all these, and secure the profits thereon, through subordinate companies which it shall control, by retaining a majority of the stock in each.

Careful investigation demonstrates that these improvements can be made at the outset, by private enterprise, for much less than municipal governments ever provide them, and that this Company can make them and then sell its lots in Harriman at less than lots have been uniformly sold for in the new cities farther South, where no such

improvements were made. Buyers of lots thus improved before sale, or thus improved after sale under a guarantee so to improve them, will not buy also a certainty of large taxation for years to follow, as in the cities referred to, but will secure almost entire exemption from municipal taxes and bonded indebtedness for quite a term of years, while the East Tennessee Company will profit perpetually from the water, light and street car systems to be established, either of which, in a town of 5,000 or more, is a source of large net revenue.

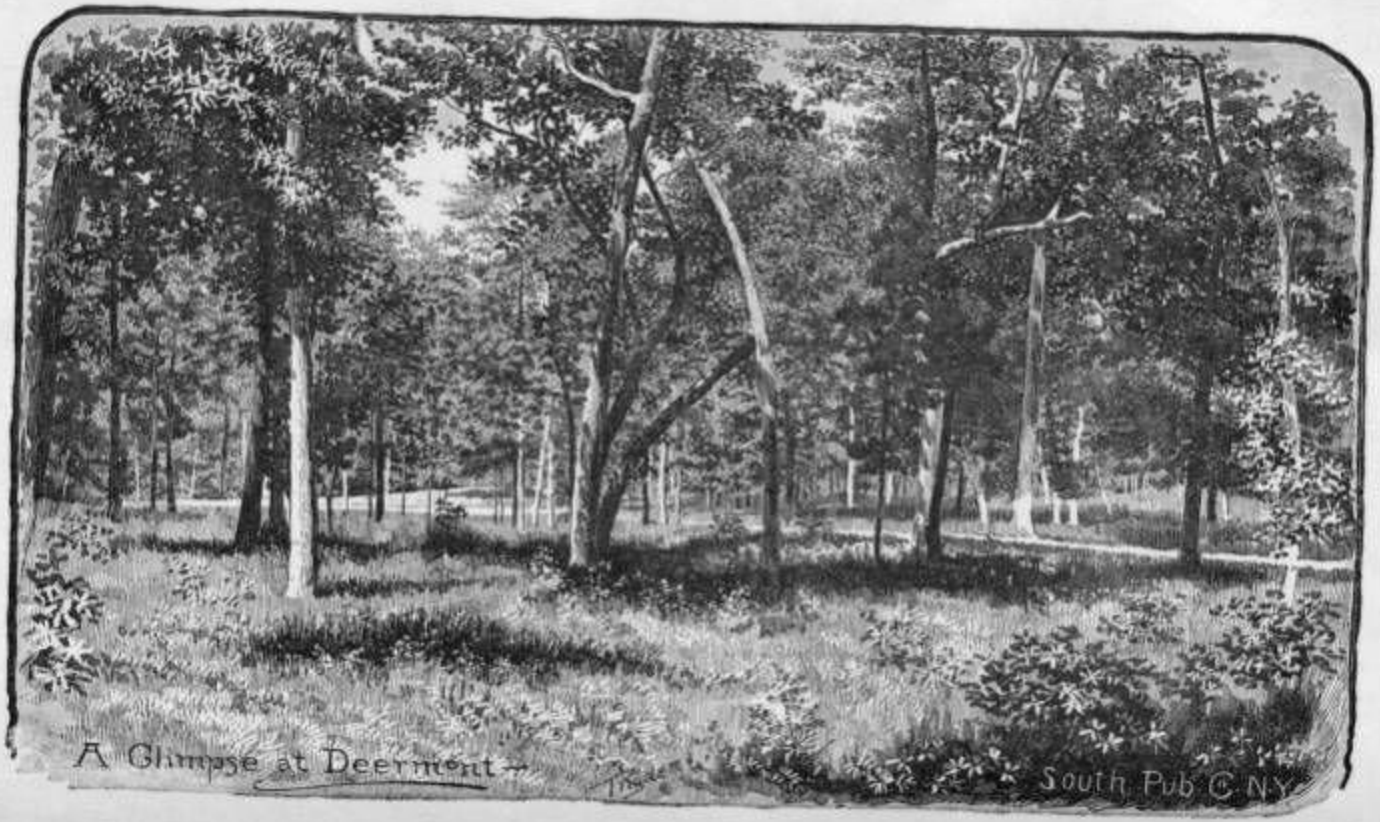
A word or two more as to Harriman: It is 1,000 feet above sea level, and beyond the yellow fever range. Its location is cool in summer, warm in winter, and healthful all the time.

Reference to the map will show that the vast coal fields of this Company are drained by the Emory River and its tributaries, and that the only natural outlet for this whole region, comprising nearly five hundred square miles, is at Harriman, which, by the logic of commerce, must become a central distributing point for coal and coke, particularly south, southeast and southwest, and a base of supplies for the entire region itself, with its multiplying mines, and its rapidly increasing population. In addition to this, a large portion of the Tennessee Valley, with its thousands of farms, will find at Harriman both a convenient market and a general source of supply.

While the largest industrial plans of this Company cluster about or concentrate in Harriman, the strategic center, its management recognize rare possibilities and superlative beauty in another location upon their property, where more town-building has begun—

THE DEERMONT SITE.

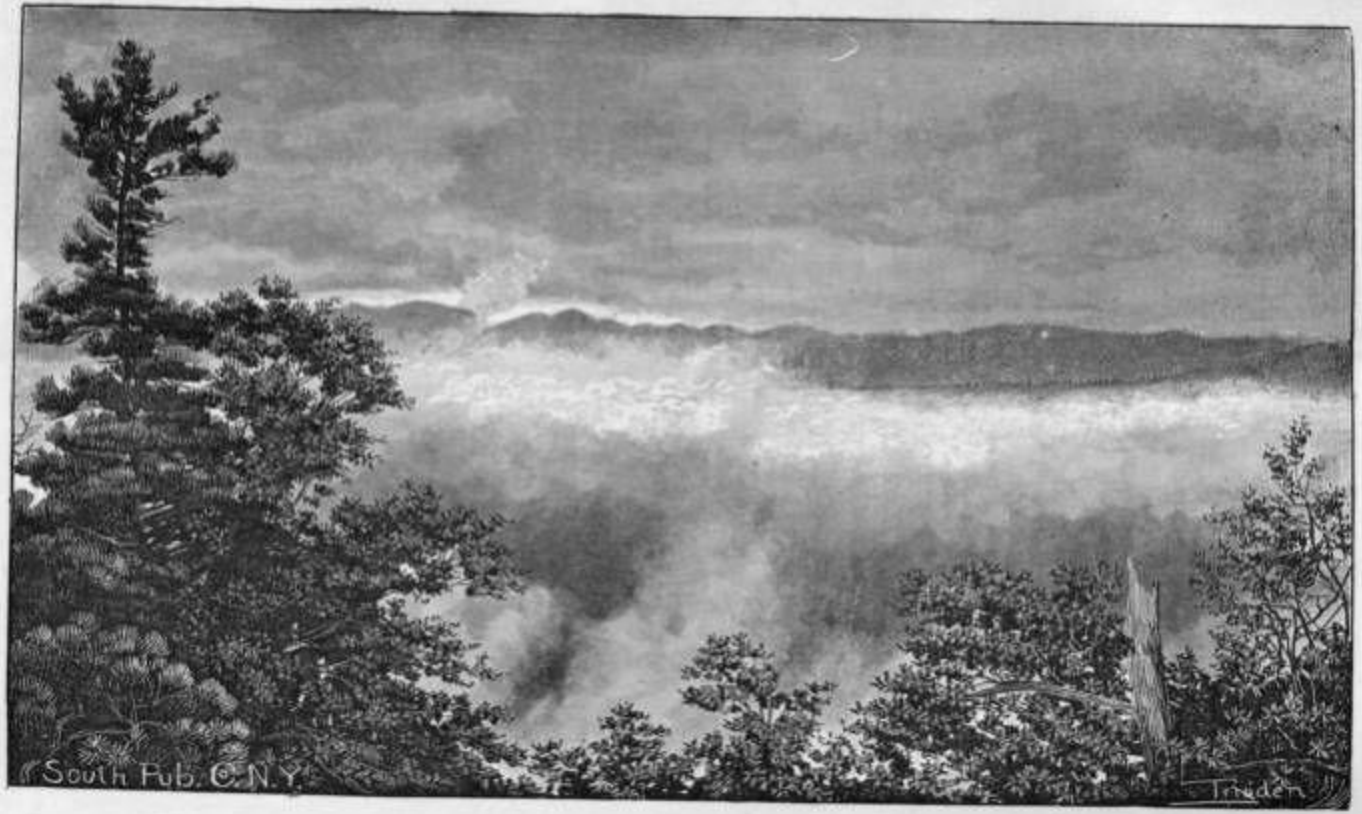
It is about twelve miles up Emory Canon from Harriman, on the Table Lands overlooking the Emory and the Wartburg Mountains beyond. The bluff here bordering the river rises nearly 700 feet above it, and slopes gently back to the Plateau proper, which lifts from fifty to seventy-five feet higher yet, and inclines both to the north and to the south from a central ridge of crescent outline, along which one of the main residence avenues of Deermont will run. From this Crescent Avenue the outlook is magnificently broad, sweeping the whole horizon, and covering a circumference from thirty to fifty miles across. Nowhere can there be found a mountain view more beautiful. When once it has been made easily accessible, and its praises have been sounded in the tourist's ears, thousands will journey see it every year, and hundreds will covet a home where daily they may behold it. Upon the sloping eminence commanding it ten thousand people can find house-room, if they wish to build there,


A Glimpse at Deermont
South Pub Co N.Y.

while on the lower portions of the site, to left and right, as many more may be located without crowding, and leave abundant space for business purposes besides.

At least one thousand acres are included in the site of Deermont, affording rare diversity of surface and of outlook, and here it is intended shall be built a great hotel, a sanitarium, an educational institution of high grade, etc., with all the comforts and accommodations of a first-class inland health and pleasure resort. For Southern people in the summer, and for Northerners in the winter, it will offer attractions peculiarly alluring. It is less than one hundred miles from Chattanooga, and sixty-three from Knoxville, from both of which it is reached by the Cincinnati Southern Railroad, traversing Emory Canon, and it is over 1,000 feet higher than either of those cities, in a region where the heat of mid-day, even in August, is tempered by delicious breezes, while every night is so cool that you sleep under a heavy blanket. Along its Buena Vista avenue, to be completed next year, those who love driving and a splendid prospect, can speed for two miles or more, winding in and out with the winding, wooded bluff which walls in Emory Chasm, and reveling in one of the grandest, most picturesque panoramas revealed by any carriage-way in all the world. Other drives, in various directions, disclose a variety of charming views, with which every lover of nature would be fascinated.

While the East Tennessee Land Company will devote its chief energies to the upbuilding of Harriman as an iron town, it believes that Deermont also has an assured future. As a near outlet for the wide agricultural country round about it, and especially south and west of it, which can best reach the railroad over highways radiating from it, the growth of Deermont must be steady from the opening of these highways and the settlement of the lands through which they will lead. And as an all-the-year-round residence for those who have tired of long Northern winters, and covet a climate neither too hot nor too cold, it cannot fail to win population and thrive. Two thousand feet above the sea, it has the salubrious air of Colorado, the mildness in winter of Southern Kentucky, the surrounding fertility of Ohio and the healthfulness of a region where malaria is unknown, where frost kills every germ of disease, where consumptives find life renewed, where the grip of asthma gives way, and where the purest water is abundantly found. Its winter season does not begin till the Holidays, and seldom lasts later than March 1st. Snow rarely falls even during that brief period, and remains but a day or two at the most, as a rule.



ABOVE THE CLOUDS AT DEERMONT.

For some very weak invalids, who wish a genuine Southern winter, Deermont may be found unsatisfactory from New Year's till February's end; but these will be few, and even they will enjoy its crisp, glorious Indian summer weather throughout November and December, and its early spring days through March and April, when flowers bloom upon every hand, and early grasses make the forests green, and sunshine invites to walks and drives out in the quickening air. As a half-way retreat for such, between the North and the South, Deermont must become widely popular.

The town has been surveyed and mapped, will soon be liberally laid out, and lots in it will then be offered at public sale. The Company's manager has erected a commodious residence there; several other families have come there to reside, and a store and a roomy boarding-house have been built. A wide carriage road is under construction down the mountain, on a grade of seven feet to the hundred, by easy zig-zags, and reaching the proposed railway station directly below and opposite the town.

Formerly known as White Horse Mountain, and a favorite feeding-ground of deer, Deermont will soon be the chosen resort of multitudes craving rest, re-invigoration and health, in the midst of environments which yield perpetual delight.

THE DEMAND FOR IT.

"Will not the establishment of two towns be a division of effort, and result badly for both?"

Such a question may naturally be asked by one who is unfamiliar with the region in reference. But the facts are, that any farming section must have its near outlet; that most of the wide agricultural possessions of this Company on the Cumberland Plateau can have no convenient outlet at Harriman, where Nature herself ordained that a city should be; that farmers can haul their produce easily to Deermont, when they could only reach Harriman by long and difficult wagon-haul, or by rail; that the best development of these farming lands will require such a town within easy hauling reach of farmers; and that there is great and growing demand for a summer and winter resort on the Plateau, where hitherto no such resort has been established. This demand would be soon met by other parties if the East Tennessee Land Company did not recognize and meet it. It comes from every portion of the State, and from outside localities where the Plateau's incomparable climate has been made known. It can be met by this Company with positive gain to every other interest the Company has.

Beyond this actual demand the Company's policy does not reach, and its expenditures at Deermont will be such only as are justified by conditions there. This policy includes no division of effort. Its execution will serve but the one purpose of success at one central point. With the wide agricultural country to be developed and populated back of Deermont, and with all that and Deermont back of and contributing to Harriman, this one purpose of success will be centralized and assured.

AS TO MORALS, EDUCATION, ETC.

By provisions of the Tennessee Four Mile Law the liquor traffic could be and is now debarred from large portions of the area acquired by the East Tennessee Land Company, but could not be shut away from it all. It would be inevitable in Harriman, and possible at Deermont, and as Harriman should grow and become an industrial center, with a mixed population of laborers, it would prove there, as in similar cities, a leech upon industry, a parasite upon enterprise, and a common curse. The daily record of experience in large iron manufacturing towns where saloons are permitted, amply justifies this conclusion.

Believing that city and town can be built more safely upon a moral basis than upon immorality, and that if saloons thrive laborers will not, the East Tennessee Land Company resolved to ban the chief source of immorality and unthrift by

PROVISION OF TITLE DEEDS.

Section 1 of Article IX of the Company's By-Laws reads thus:

> Every contract, deed, or other conveyance or lease of real estate by the Company shall contain a proviso forbidding the use of the property, or any buildings thereon, for the purpose of making, storing, or selling intoxicating beverages as such.

Section 1 of Article X further says:

> Sections 1 and 2 of Art. IX, and Section 1 of Art. X shall not be repealed, amended or changed, except by a three-fourths vote of all the subscribed stock of the Company.

It has been decided by the highest courts that such a provision in title-deeds is valid, and must stand. Without claiming to serve reform, or to be moved by philanthropic impulses, the East Tennessee Land Company is determined that this provision shall be faithfully guarded, in letter and spirit, and made a lasting fact. Saloons do not enhance property values in their neighborhood. To decrease the value of any given piece of property is measurably to

decrease the value of all. This Company seeks to create property values. Its financial success lies in such accomplishment. Logic is logic, business is business; therefore this Company will not permit the saloon.

Such a business policy in town-building is not experimental. The hard facts demonstrate its practicability and profit. It has been tried often, though never before on so large a scale in this country. Vineland, Asbury Park, Colorado Springs and Pullman are conspicuous examples of speedy growth where like policy has obtained.

The East Tennessee Land Company will donate suitable lots and sites for churches, schools, and all other needed public improvements, and will advance in every way proper the moral, intellectual and financial prosperity of those communities which through its efforts may be established. It is expected that churches and schools will be soon required at several points upon the Company's territory, especially on the Main Tract thereof, shown in the appended map, and large enough for many small centers of population, though within the outlines given are some properties which this Company does not yet own.

FINANCIAL BASIS OF THE COMPANY.

THE TOTAL COST

of all its vast domain—minerals, timber, farm lands, town sites, etc. —aggregates only about two million dollars. Purchase has been effected from many different holders, at a most opportune time, just in advance of the tidal wave of development now about to sweep over the Central South. So low an average of prices can never be duplicated again on any extended scale.

The lands are held by title-deeds, and by written contracts which, as rapidly as surveys are perfected, call for title in fee.

THE CAPITAL STOCK

has been fixed at $3,000,000, leaving a round million, after paying for the properties in full, as a General Development Fund. With this amount, the Company proposes to lay out highways and streets; grade city and town sites, and sewer, pipe, and pave the same; and carry forward its plans of colonization and town-building, as outlined in previous pages. The necessary capital for mineral development, for manufacturing, etc., will be provided by subordinate companies, already organized or in contemplation, or by individual enterprise. Should the General Development Fund prove insufficient, because of unexpected growth or demand, a portion of the Company's profits can be set aside for like purpose.

Whoever has carefully read and fully comprehended the pages preceding, must perceive how small is a capitalization of $3,000,000 on such basis as has been described, compared with the capital of every other company of this kind. The capital stock of this Comp represents actual value, without inflation, but does not approxi the entire value of the properties on which it is based. It w intention of the projectors and incorporators to shape this ent so that its stock should be as solid as that of a national ba

Over half a million dollars of its capital were subscrib the Company's organization, at par. Subscriptions for the

are now solicited,—shares Fifty Dollars each, payable twenty per cent. down, the balance in monthly installments of ten per cent. Receipts will be given for each payment, and when the final payment shall have been made, proper certificates of stock will be issued, signed by the President and Secretary, and *full paid and unassessale.*

Under the Corporation laws of Tennessee, stockholders of land companies, who have paid for their stock in full, incur no further liability.

SPECIAL INDUCEMENTS.

This Company appeals not only to men as investors, but as settlers. It desires both takers of its stock and purchasers of its land, lots, timber, mineral leases, etc. It believes that investment and purchase may with profit go hand in hand.

As an inducement for men to buy stock, and also to become purchasers of its property, the following provision was incorporated in its By-Laws:

ART. I, *Sec.* 4.—Any stockholder whose stock is full paid may purchase land of the Company, after the same shall have been listed, priced and offered for sale, and apply his stock on the first payment for such lands at its par value, and on all lands which he may fully pay for in stock he shall reeeive a discount from the selling price fixed for said lands, as follows:

On all such lands purchased before July 1, 1890, and paid for in stock, he shall receive a discount of 25 per cent.; and thereafter on all lands purchased before Jan. 1, 1891, 20 per cent.; and thereafter on all lands purchased before Jan. 1, 1892, 10 per cent. Provided that in the event a stock dividend shall at any time be declared, the stock issued as dividends shall not be entitled to any of the rights, privileges or benefits conferred by this By-Law, in paying for lands and obtaining discounts.

Under this provision investment may be first made in the capital stock, and this may later be converted into lots, land, etc. So converted before July 1st, 1890, One Hundred Dollars of stock has the same purchasing power as $133.33 in cash. Every farmer, merchant, mechanic, iron-manufacturer, coal operator, invalid and capitalist, who would now acquire possessions, a business plant, or a home, amid onditions most favorable, and on terms unprecedented, should sub- ·ibe at once to the stock, with purpose to embrace this remarkable ›rtunity.

'his provision also offers peculiar advantage to those who dislike ıoldings in large stock companies, since under it the way is any time for them to exchange their stock investment for individual property, at an actual premium if the exchange be ›re January 1st, 1892.

The purchase of so many different tracts as comprise this Company's territory, and the massing them into one common whole, under one management, would alone greatly increase the market value of all. The expenditure of a million dollars in improvements as planned, will beyond any question so much further increase values, that within one year's time they should reach a total of $6,000,000. In such handsome increase a great multitude of people can and will share. As was said at the outset, this Company is not monopolistic, but co-operative, in the most practical sense. Large plans of colonization could not be carried out, at little cost to each person they might benefit, unless a large landed area were secured by one organization. Secured as it has been by this Company, and offered on such terms as are and will be made, the buyers of stock and the settlers on the land have mutual interest, while no one has or can have a monopoly.

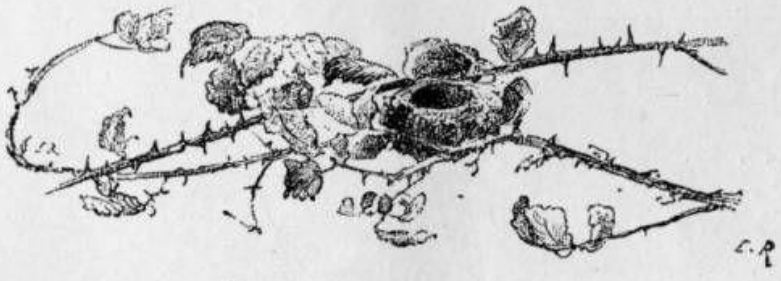
IN CONCLUSION.

The mammoth enterprise thus outlined means more than mere individual profit. Located near the border line of two sections once at feud, its large success will have national influence, and be productive of world-wide good.

The stock of such an enterprise is not likely to remain long unsold, and your co-operation in the speedy work of placing it is cordially solicited. A complete copy of the Company's By-Laws will be mailed on application. Address all communications to

A. A. HOPKINS,
Secretary, 96 Broadway, New York.

All remittances should be made payable as per order on back of this page.



ALWAYS USE THIS FORM IN SUBSCRIBING FOR STOCK.

A. A. HOPKINS, Secretary, etc.

Dear Sir :

I hereby agree to take ..... shares of the Capital Stock of the East Tennessee Land Company at $50 per Share, and pay for the same in installments as follows : 20 per cent. down, and 10 per cent. monthly hereafter until paid; certificate to be issued to me when the stock shall have been paid for in full. I inclose with this draft for $..... payable to the order of A. W. Wagnalls, Treasurer, being the 20 per cent. down payment, on amount for which I have subscribed above, and hereby appoint ..... or any other person whom he may deputize, in writing, to sign my name to the stock subscription book of the Company for the said number of shares of the stock.

Please return Treasurer's receipt therefor and oblige

Yours, etc.,

Name in full .....

P. O. Address .....

County .....

and State .....

REPORT OF JO. C. GUILD.

CHATTANOOGA, TENNESSEE, November 1st, 1889.

MR. FREDERICK GATES, *General Manager of the East Tennessee Land Company.*

SIR:—In making my report on the mineral land and mines of the East Tennessee Land Company, I will confine myself to that part of the property which I have thoroughly examined and am fully conversant with. Although I am aware that this will not embrace a vast amount of the coal lands of the Company, lying on the Cumberland Mountains, property of almost inestimable value, still I will leave this to others more fully acquainted with it in detail.

My report will cover: First, the Tennessee River ore property; second, the iron ore lands lying north of the Big Emory River; third, the coal measures of Walden's Ridge; fourth, the iron and manganese ores of Iron Mountain, Carter County, Tennessee; fifth, the magnetic iron ores of May's Ridge, Carter County, Tennessee.

Hoping this may meet your approbation,

I am, most respectfully yours,

JO. C. GUILD,

Assistant State Geologist for Tennessee.

THE TENNESSEE RIVER ORE PROPERTY.

The character of the iron ore of this very remarkable deposit is what is commonly called "*Red Fossil*" or "*Dye Stone*" *Hematite*. The geological position of this ore is the Clinton group of the Niagara period. It is of the same general character and of the same geological horizon as the *Hematite* ores of the Chattanooga and Birmingham districts. In fact, it is a part of the great outcrop of this ore extending from Pennsylvania through the intervening States far into Alabama.

While it is a part of this great bed of ore, still it is not in the direct line of the general outcrop, which, as a rule, from Virginia south, lies near the coal measures and at the base of the plateau which the carboniferous rocks form.

This deposit of ore lies about eight miles east of the foot of Walden's Ridge, which forms the eastern escarpment of the table land at this point and extends parallel with it.

This bed of ore owes its existence to one of the great Appalachian folds extending northeast and southwest, lying as it does in the trough of one of these great synclines, and thus being saved from denudation, having rocks of an older period both northwest and southeast.

The length of the deposit is ten to eleven miles, and has an average breadth, from the outcrop of one arm of the syncline to the outcrop of the other, of twenty-six hundred feet. The northern end of this deposit or bed of ore is on the south bank of the Tennessee River, nearly opposite the town of Kingston, it all lying in Roane County.

The Company own the north half of this deposit, their property being five and one-half miles long and about one-half mile wide. On page 43 is a sketch of the property and a section across the syncline, showing its general form and the occurrence of the *Iron Ore*.

It will be observed that the western arm of the syncline slopes very gradually towards the bottom of the trough, the bed of ore being parallel to and conforming with the southeastern slope of the range of hills. The covering on this part of the bed varies from nothing to sixty feet, the greater part having only a few feet of earth over it.

The eastern arm of the syncline suddenly turns up vertically, or nearly so, outcropping along the top of the eastern range of hills.

All of this ore was originally highly calcareous and what is commonly called "*Hard*" or *Lime ore*, but that part of the bed through which it is possible for the water to filter has become "soft ore," that is, the lime has dissolved out, leaving a soft skeleton ore.

A glance at the section will show that this bed lies remarkably advantageously for the change of most of the ore to the soft or leached variety, which is really the case.

Of course this leaching process forms an ore of a very much higher percentage of iron, but has not the lime of the "hard ore," which is of advantage in the furnace as a flux.

A mixture of the soft and hard ores in the furnace is most advantageously used in the manufacture of iron.

The average elevation above the valley of the western outcrop of ore is about two hundred and fifty feet, and the average elevation of the eastern about one hundred and fifty feet. A feeble idea of the amount of ore may be gathered by imaging a canoe shaped vessel, of which the shell is the iron ore; the length of this vessel five and one-half miles, the width one-half mile, the height of one side two hundred and fifty feet, that of the other side one hundred and fifty feet, and the thickness of the shell six feet, and still this is the easiest and cheapest mined iron ore of any kind I have ever seen anywhere.

The thickness of the bed of ore varies from five feet, the thinnest seen, to a thickness of twelve feet, the thickest seen.

But the bed is one of remarkable regularity as to thickness, it being six to seven feet almost everywhere.

On the next page I give a few sections across the bed of ore.

Section number one, taken at Hackler's, is a typical section of the bed of ore. One shale parting in the ore from twelve to thirty inches thick occurs everywhere, and locally a second thin parting sometimes occurs two to six inches thick; but this is purely local and soon disappears.

Section number two is a section of the hard ore taken at Hackler's Gap, and shows a remarkable thickness of ten feet two inches, with a shale parting two feet thick.

Section number three was taken of the vertical part of the bed, near Eureka. In this section occur two shale partings, one four inches and the other fourteen inches, but the upper or four inch parting disappears in a distance of ten feet.

Below the ore is a highly ferruginous sandstone, which is always found in place.

The shale which occurs with the leached ore is very soft, easily worked and of a light buff color, while the same shale occurring with the hard ore is a light blue color and very hard, but nevertheless separates cleanly and easily from the ore.

The ore is oolitic in character, especially the soft ore, and filled with chrinoidal buttons, whence the name "fossil ore."

Some analyses of the ore are as follows:

LOCALITY.	IRON, PER CENT.	SILICA, PER CENT.	PHOSPHORUS, PER CENT.	CARBONATE LIME, PER CENT.	ALUMINA, PER CENT.
1. "Hard ore," Hackler's Gap, leanest ore found.....	27.20	5.54	0.400	48.07	2.74
2. "Hard ore," Hackler's Gap.....	44.12	6.82	0.404	26.64	
3. "Soft ore," Hackler's Gap, average across bed.....	51.32	12.17	0.520		
4. "Soft ore," Hackler's Gap, top of incline.....	51.16	11.56	0.493		
5. Eureka-Vertical bed, lower level—top.....	52.75	9.25	0.550		
6. Eureka-Vertical bed lower level—foot.....	50.64	15.86	0.462		
7. Eureka-Vertical bed, upper level—foot.....	50.07	11.13	0.481		

It will be observed that five analyses of "soft ore" are given an average of fifty-one per cent. of iron, twelve per cent. of silica, and five-tenths of one per cent. of phosphorus. The "hard ore," Nos. 1 and 2, show respectively 48.07 and 26.64 per cents. of lime, which is of considerable importance as flux for the impurities in the ore, the limestone and the ash of the coke.

No. 1.

No. 2.

No 3.

No 4.

DEVELOPMENTS.

The mines on this property were first opened by Mr. J. D. Roberts about the year 1880, when ore was sold to the Roan Iron Company, who used it in their furnaces at Rockwood.

Since that time ore has been shipped to the Roan Iron Company, to the Dayton Coal and Iron Company's furnaces at Dayton, Tennessee; to the Citico Furnace Company's furnace at Chattanooga; to the Chattanooga Iron Company's furnace at Chattanooga, and to the Tennessee Coal, Iron and Railroad Company's furnaces at South Pittsburg, nine stacks in all, at all of which places it has been used very satisfactorily.

The main works on the property are located at three points, namely: Hackler's Gap, Eureka and Round Island.

There is a narrow gauge railroad, something over five miles long, connecting Hackler's Gap and Eureka mines with a wharf on the Tennessee River, and Round Island is connected with another wharf on the river by another tram road. The ore is shipped by water to the different points named, all of which are located on the Tennessee River.

The railroad is built parallel with the range of hills in which the ore lies, and in this ridge are two main gaps, through which spurs of the main line of railroad have been constructed. The ore is mined and loaded into tram-cars of from one and one-half to two tons capacity and delivered on board flat cars of ten tons capacity at these gaps and hauled to the river by locomotives. At Round Island, however, a tram-road one mile in length delivers the ore directly to the river in the mine cars.

HACKLER'S GAP.

This point is located about the middle of the property, and here the ore is mined altogether by stripping off the dirt on top and digging out the ore with picks alone.

Nowhere is any blasting done in mining "soft ore," but steam drills and blasting have been used in mining hard ore. An incline about four hundred feet long, operated by gravity, is constructed to deliver the ore from the top of the hill to the level of the railroad. Also much ore is mined at this point near the lowest point of the syncline by stripping off the top.

EUREKA MINES.

Here also much ore has been and is mined by stripping the top covering off the inclined arm of the syncline, but the main works are located on the vertical arm. This is the only point at which any work has been done on the vertical part of the bed of ore. Here, in a hill nearly one-half mile long, three entries, one above the other, have been driven in about half the length of the hill. This hill is nearly two hundred feet high, and the ore stands vertically up through the centre of the hill from end to end. At water level and in the end of the hill an entry has been driven in entirely on the ore. Forty feet above this another entry has been driven, parallel with this and connected at intervals with it by air courses. Again a similar entry has been driven forty feet above this last, and also connected by air courses. This upper entry is connected with the outer air by air courses at intervals, thus preserving an excellent natural ventilation. All this work is done without moving any material other than ore, if we except the small amount of shale forming the parting. No "hard ore" at all is found in this mine.

ROUND ISLAND.

Here no ore has as yet been mined, but preparations have just been completed for commencing operations. There is here a large tract of surface ore, over which is only a thin covering of earth. The tram-road has just been completed, and houses, stables, etc., built, and the ore opened in a number of places, preparatory to beginning mining operations.

At all three of these points—Hackler's Gap, Eureka and Round Island—are well stocked stores, company houses, stables, with all mules and tools necessary for mining operations, miners' houses, etc., etc.

The output of the mines during the last twelve months was eighty thousand tons of ore, which can be very much increased at a small outlay for equipments; even trebled or quadrupled.

COST OF MINING.

This is, beyond a doubt, the cheapest mined ore of which I have any knowledge.

The miners are paid twenty cents per ton of 2,268 pounds for mining and loading the ore into tram-cars on the vertical part of the bed, and it costs a little less to mine the ore which is stripped, this being done by day labor altogether.

To this first cost must be added the cost of delivering the ore on the wharves at the Tennessee River, but again a large part of the wages paid the miners is spent in the company stores, where a very substantial profit is made.

PRICE OF ORE.

The iron ore from the Tennessee River mines is worth, delivered at the wharf at Chattanooga, one dollar and sixty cents per ton, and the freight by boat from the wharf at the mines to the wharf at Chattanooga is thirty-five cents per ton, so that the value delivered on board the boat at the wharf is one dollar and twenty-five cents per ton.

When the railroad is constructed from these mines to Harriman, ore can be delivered to the latter place fully as cheap as it can be delivered on board boat, so that the price of "soft ore" at Harriman will be one dollar and twenty-five cents. Taking the average of the ore at fifty-one per cent. of iron, the ore to make one ton of pig iron can be delivered to Harriman for two dollars and forty cents, and this allowing a very substantial profit to the miners of the iron ores.

IRON ORES NORTH OF BIG EMORY RIVER.

The ores occurring on this part of the Company's property are of the same species as the last described, that is, hematite of the Clinton group of the Niagara period, and commonly called "Red Fossil" or "Dyestone" ore, but differing somewhat in the form of the bed, composition of the ore, and the thickness of the deposit.

This property includes about ten miles of what is commonly called the "Mountain Lead," that is, the outcrop of ore lying next to and at the southeastern foot of Walden's Ridge; also, two other lines of outcrop, together about ten miles long, brought to the surface by geological faults of the strata.

The secondary outcrops are parallel with the Ridge, and are respectively thirteen hundred and two thousand feet distant from the "Mountain Lead."

This property begins about one mile south of the point at which the Big Emory River passes through Walden's Ridge, the site of Harriman, and extends northeast with the Ridge to a point ten miles northeast of Emory Gap.

The Company's property for this distance also covers Walden's Ridge, with its coal, joining on the south both the iron and coal property of the Roan Iron Company.

See sketch (plate 3) showing outcrop of iron ore and coal, also geological section (plate 4) across Walden's Ridge and the iron ore ridges.

The geological section is only approximate, but shows the general form of the strata. It is taken across Walden's Ridge in a southeast direction, across the two iron ore ridges.

Walden's Ridge at this point is one thousand feet above the valley. The ore ridge next the Ridge is two hundred and fifty feet above the valley, and the other about the same altitude. Although the sub-carboniferous limestone is quite thick at this point, at least one thousand feet, only a small section of it is exposed on the surface, a fault or slip of the strata bringing the Upper Silurian close up to the Coal Measures. Southeast of the ore ridge occurs a narrow valley in the Trenton Limestone, and next southeast of this is a ridge composed of white Chert from the decomposition of Dolomite, in which layers of this Chert occurred; next is a narrow shale valley where a fault occurs, repeating the above sequence commencing with the Clinton group.

In the ore ridges the strata are almost vertical; in that next Walden's Ridge quite so, and in the other shown in the section the dip is southeast eighty degrees. There are always in each ore ridge at least two beds of ore from fifty to eighty feet apart, and both above and below the ore is a soft light-buff weathered shale. Generally, however, only one of these beds in each ridge is of workable thickness. This workable bed is from twenty inches to five feet in thickness, and remarkably regular in quality. A small amount of surface ore has been mined at several points along the outcrop, and at one point a shaft was sunk to a depth of sixty feet. I have measured the thickness at several points as follows: On the "Mountain Lead" one place twenty-four inches, another twenty-eight inches, another twenty-six inches, and another, thirty-seven inches. On the outcrop occurring thirteen hundred feet from the "Mountain Lead," at one point the ore bed measured as follows: Eighteen inches of ore, fifteen feet of shale, fifteen inches of ore, four feet of shale, twenty-four inches of ore, making in all four feet and nine inches of ore.

The "soft" or leached ore on this property contains a very much higher percentage of iron than the Tennessee River ore, is lower in silica and phosphorus, but still the mining of this ore is more expensive on account of the thinness of the bed. Further, the ore, while it becomes "hard" or calcareous below water level, still it never becomes so low in percentage of iron, however deep the ore may be mined, as the "hard ore" of the Tennessee River.

The Roan Iron Company have mined this bed of ore two miles south of this property to a depth of four hundred feet, to which depth the ore is still good.

I append a few analyses of some samples of this ore taken by myself :

LOCALITY.	IRON, PER CENT.	SILICA, PER CENT.	PHOSPHORUS, PER CENT.	CARBONATE OF LIME, PER CENT.
Soft ore, Mountain lead.....	59.34	11.22	0.197	
Hard ore, Middle "	45.30	9.42	0.352	23.80
Soft ore, " "	56.18	7.00	0.224	
Hard ore, " "	35 07	10.22	0.427	37.06
Soft ore, " "	57.45	9.71	0.386	
Soft ore, " "	58.30	11.92	0.469	

This is an excellent ore, very high in iron, low in silica, and containing hardly any alumina.

The ore is compact, and when taken from the bed separates in regular diamond-shaped pieces, showing bright, smooth slicken sides on each face.

There is on the property about twenty miles of the outcrop of this bed, which is nearly all of workable thickness. The Roan Iron Company own about fifteen miles of the outcrop of this bed just south of this property, and have mined there much of the ores used in their two furnaces at Rockwood for the last twenty years. They have used for some ten years a mixture of the Tennessee River ore and that from the mountain lead most successfully, having made iron of good quality as cheap as, if not cheaper than, anywhere in the South. The Roan Iron Company have, at several points on their property, sunk slopes to a depth of four hundred feet on the mountain lead, and everywhere found ore of good quality. In fact, those ores occurring on the company's property north of Emory River are of excellent quality, clear and bright.

COST OF MINING AND VALUE OF THE ORE.

While it will cost slightly more to mine this ore and deliver it to Harriman than the Tennessee River ore, on account of the thinness of the deposit, still it is a more valuable ore for the manufacture of iron. The Tennessee River " soft " ore averages fifty-one per cent. of iron, while the Emory soft ores average at least fifty-seven per cent. iron. Some iron-masters contend that for every unit of percentage above fifty per cent. an ore is worth an additional ten cents per ton. It is quite evident that the increase of percentage of iron in an ore affects its value very materially, and the value per unit of percentage above fifty per cent. is greater than the value of each unit of percentage up to fifty, other conditions being the same, for the reason that less fuel and flux are required to smelt a ton of pig iron from the high percentage ore, and necessarily the cost of labor per ton of metal is reduced, for the output of the furnace is very materially increased by the use of the high grade ore.

Assuming the additional percentage of iron to be only worth five cents per unit per ton of ore, the Emory ores would be worth, delivered at the furnace, thirty cents per ton more than the Tennessee River ores, or one dollar and fifty-five cents delivered at Harriman, at which price it can be delivered with a good profit to the miners.

THE WALDEN'S RIDGE COAL.

The coal measures of Tennessee form a great block or table of mountains, rising from twelve hundred to two thousand feet above the level of the valley. In this table-land the coal measures generally lie approximately horizontal. The eastern edge of this table-land has been turned up till the strata are almost vertical, by one of the great Appalachian folds extending far to the northeast and southwest.

From Dayton, Tennessee, northeast, past Emory Gap and into Virginia, this upturned strata forms a semi-detached ridge or chain of mountains, which is called Walden's Ridge. This ridge rises on the property of the East Tennessee Land Company to an altitude of from eight hundred to twelve hundred feet above the level of the valley.

On the next page is an illustration (plate 5) showing the rocks and coal beds as they actually occur in Walden's Ridge, and their probable condition below the level of the valley.

In this section I have numbered the beds of coal as found in the ridge, commencing with number one, the lowest geologically, and ending with number six, the highest. As far as investigations have been carried, only three of these beds are of economic importance—that is, numbers two, four and six.

Bed number two of this section is commonly known throughout Tennessee as the Cliff, or

Main Etna, and is very successfully mined at a number of places in this State, Alabama and Georgia.

Coal bed number four is the most important bed of coal of the Tennessee coal field; that is the Main Sewanee.

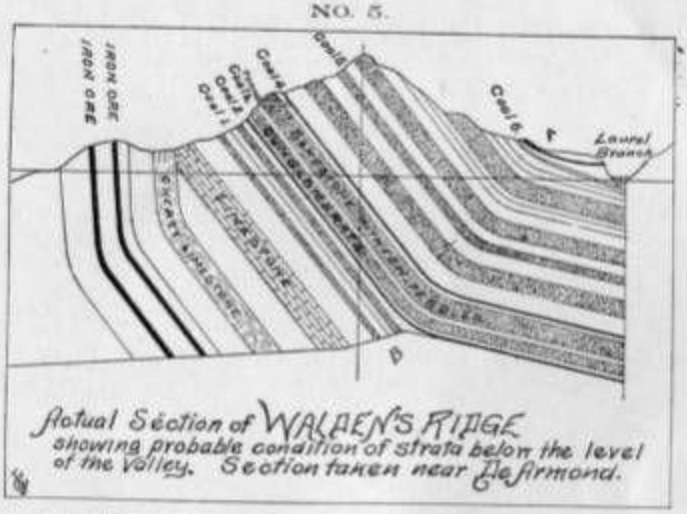
This is the bed from which the Tennessee Coal, Iron and Railroad Company, the largest iron manufacturing company in the United States, draws the coal from which coke is made to supply their furnaces.

The mines of the Roan Iron Company, adjoining the East Tennessee Land Company on the south, are located on this bed of coal.

At the Roan Iron Company mines the rocks are somewhat more disturbed than on this property. Very extensive mining operations have been carried on for the last twenty years, these mines having produced all the coal for the manufacture of the coke to supply the two stacks located at Rockwood.

The output is about one million five hundred thousand bushels of coal annually, which is manufactured by one hundred and eighty coke ovens of the "bee-hive" pattern into a good, strong furnace coke. This bed of coal is also mined extensively at a number of other points in this State for steam coal and the manufacture of coke.

NO. 5.



Actual Section of WALDEN'S RIDGE showing probable condition of strata below the level of the Valley. Section taken near Del Armond.

The outcrops of both beds two and four can be traced almost the entire length of the East Tennessee Land Company's possessions on Walden's Ridge, and show coals remarkably clean and pure, being high in carbon and low in ash and sulphur.

These outcrops occur along Walden's Ridge near the summit and dip very sharply in a northwestern direction into the Ridge.

There is a good exposure of coals one, two and four, in the gap of Walden's Ridge, through which the Big Emory River cuts its way, and on the site of Harriman. Here the Cincinnati Southern Railway, on its way from the North to the South, passes through the gap, crosses the Emory River and curves sharply around the point of Walden's Ridge in a deep cut, where it exposes the strata for several hundred yards, and the coal beds and rocks are seen in their natural sequence.

Below the railroad at this point and on the level of the valley an entry has been driven in on the outcrop of coal, number two, in the end of the Ridge on the south side of the gap.

This entry was opened to supply the local demand, and some has been hauled seven miles to Kingston, the county site of Roane County.

Coal from this mine has quite a reputation in the country round for its excellence. The bed of coal in this entry shows an average thickness of about five feet, varying from two to eight feet; however, the thinness at two feet is caused by a "roll" in the shale top and extends only a very few feet. Both the top and bottom of this bed is a good strong shale. The entry has been driven in about four hundred feet and a room opened above, from which a small amount of coal has been taken.

I give three analyses of coal taken from this entry, and of coke made in the laboratory from these samples, as follows:

Sample 1.—Hygroscopic moisture	1.50
Volatile matter	33.97
Fixed carbon	61.29
Ash	3.24
	100.00
Sulphur (separately determined)	1.085
Coke made from the above (bright and hard):	
Fixed carbon (by difference)	94.98
Ash	5.02
	100.00
Sulphur (separately determined)	0.511
Sample 2.—Hygroscopic moisture	1.69
Volatile matter	33.57
Fixed carbon	61.95
Ash	2.79
	100.00
Sulphur (separately determined)	0.613
Coke from the above (bright and hard):	
Fixed carbon (by difference)	95.69
Ash (light red)	4.31
	100.00
Sulphur (separately determined)	0.656
Sample 3.—Hygroscopic moisture	1.14
Volatile matter	35.02
Fixed carbon	61.52
Ash	2.32
	100.00
Sulphur (separately determined)	1.005
Coke from the above:	
Fixed carbon (by difference)	96.38
Ash (light red)	3.62
	100.00
Sulphur (separately determined)	0.852

While it is very true that when the coal is mined in quantity and coked in ovens, the coke may not show quite so well as to quality, still these analyses are a correct exponent of the quality of the coal and coke.

The principal opening on bed number four is near De Armond Station, on the East Tennessee, Virginia and Georgia Railroad, five or six miles northeast of Harriman.

Here the bed of coal outcrops about three fourths of the way up Walden's Ridge, and this is the point at which the section (plate number 5) was taken.

In this section it is observed that the coal beds dip to the northwest at an angle of about forty-five degrees, and with the rocks of the Ridge. These rocks extend down under the Ridge for a great distance, then turn under the main Cumberland Mountains. It is our opinion that from the point of outcrop of coal four to the point at which the bed becomes nearly level, is at least two thousand feet. The strata at Laurel Branch begin to turn and become flat, and a line drawn from A to B (plate 5) would be the axis of the syncline, thus throwing the point of flexure of bed four to a great distance below the point of outcrop.

Considerable coal has been mined here, for local consumption principally. A tunnel was driven through the rock about one hundred feet below the outcrop into the coal: then entries were turned to the right and left on the bed of coal, which was taken out by stopping from above.

This tunnel is so caved that it is impossible to get in to the coal at the present time, but a large opening is made above on the outcrop which shows a thickness of about six feet. In this opening can be seen a great variety of the fossil plants of the coal measures similar to those found both at Rockwood and at Tracy City, where the mines are located on this same bed of coal.

Professor Colton, in a report on the Coal Measures of Tennessee, page 57, says of this mine, which he calls the Emory Mine: "The seam is very regularly five feet thick," and again, on page 58, he says:

"It is a valuable property; the coal made a strong, good coke, nearly free from sulphur. In the neighborhood is a good site for an iron furnace."

An analysis of this coal taken from the opening on the outcrop above the old mine near De Armond is:

Sample 4.—Hygroscopic moisture	1.90
Volatile matter	28.34
Fixed carbon	63.11
Ash	6.65
	100.00
Sulphur (separately determined)	0.961

Coke made from this sample:

Fixed carbon (by difference)	90.46
Ash (salmond)	9.54
Sulphur (separately determined)	1.025

Sample 5.—Taken from the outcrop of bed 4 in the railroad cut at Harriman:

Hygroscopic moisture	1.62
Volatile matter	30.85
Fixed carbon	63.01
Ash	4.52
	100.00

Coke made from the above sample:

Fixed carbon	93.30
Ash (red)	6.70
	100.00

The coal from beds two and four is very clean and bright and free from shale, and makes a firm, strong coke.

The cokes made from coal occurring around Chattanooga contain from twelve to twenty per cent. of ash, and from one and a quarter to two and one-half per cent. of sulphur, while the coke made from these coals contains only from three and sixty-two hundredths to nine and fifty-four hundredths per cent. of ash, and from five hundred and eleven thousandths of one per cent. to one and twenty-five thousandths of one per cent. of sulphur.

The Pocahontas coke, made at Pocahontas, Va., is considered the best coke in the South, the analysis of which is as follows:

Fixed carbon	92.662
Ash	7.338
	100.00
Sulphur (separately determined)	1.275

It will be seen that most of your coals show a lower percentage of ash, and all of them a lower percentage of sulphur. It must be remembered that the lower the ash and sulphur, and the higher the carbon, the more valuable is tho coke as a fuel.

COST OF MINING.

The best criterion as to the cost of mining this coal is the price paid miners at Rockwood, which is thirty-seven and one-half cents per ton. To this must be added all other expenses attached to the mining of coal.

We may say that an excellent coke may be delivered at Harriman at extremely reasonable figures.

In concluding my remarks on the coal and iron occurring around Harriman, I think I may confidently state that all the conditions are present for the cheap manufacture of iron. An abundance of iron ore, both hard and soft; an inexhaustible supply of good coking coal, and good limestone for flux on every hand—all of these occurring as they do here in a stone's throw of each other, it seems the only thing lacking for the cheap manufacture of iron is efficient and reliable labor, which I believe it is the Company's object to acquire.

IRON AND MANGANESE ORES OF IRON MOUNTAIN.

The tract on which these ores are found is situated several miles north of Elizabethton, in Carter County, Tennessee.

Iron Mountain is a high ridge of Potsdam rocks, extending across Carter County in a north and south direction. Stony Creek flows south in a valley about two miles wide on the west side of Iron Mountain and empties into the Watauga River just north of Elizabethton. On the west side of the valley of Stony Creek is a mountain range, corresponding to the Iron Mountain, and called Holston Mountain. Near the Johnson County line Holston and Iron Mountains come together and become one, whence they extend on and into Virginia.

The East Tennessee Land Company own about five thousand acres, covering Iron Mountain for some miles.

On the east side of Holston Mountain are situated the lands of the Knoxville Iron Company, from which they draw the supply of iron ore for their charcoal furnace, located here, the output of which they manufacture into car wheels at Knoxville. On their tract this company mine two kinds of ore, limonite and specular ore.

On the Iron Mountain tract no developments whatever have been made, and really the property has never been thoroughly examined, but a great variety of ores occur on this property, and the surface indications are that they exist in large quantities.

The specular ore mined on Holston Mountain is a very dense hard ore of a steel blue color, which occurs in a solid bed, below which is a conglomerate containing small pebbles, and above is a sandy slate. This same ore I have found on the western slope of Iron Mountain, just opposite the mine of the Knoxville Iron Company, and a small hole has been opened, but only enough has been done to show that the ore is present in place and apparently in some quantity, but not enough has been done to demonstrate its actual extent.

Some analyses of the ore from the Knoxville Iron Company mines are as follows:

No. 1.—Metallic Iron	63.84
Phosphorus	0.022
No. 2.—Metallic Iron	59.19
Phosphorus	0.019

A sample taken from the surface pit on Iron Mountain is:

Metallic iron	52 91
Phosphorus	0.030

The analyses of those from Holston Mountain are somewhat better than the last, but this is only on account of the sample from Iron Mountain having been taken from the surface.

The Iron Mountain will produce just as good ore when opened, as the ores are identical.

A very peculiar ore is found on Iron Mountain. It is essentially a limonite, but contains many bright little plates of micaceous specular ore.

This ore has not been developed at all, but it is said that at one place on the property quite a "bluff" of it is found. This, however, I have not seen, but can well believe.

The composition of this ore is:

Metallic iron	55.67
Silica	12.85
Phosphorus	0.187

An excellent ore.

Limonite ore occurs at numerous points on the surface over Iron Mountain. At some points even the top and slopes of the ridge are covered with fragments of this ore, and great masses stick out of the ground. A sample of this ore, taken from the summit of the mountain, shows a very fine grade of limonite, and there is little question of it occurring in quantity.

Analysis of the ore:

Metallic iron	62.73
Silica	3.81
Phosphorus	0.191

It is evident that this ore cannot contain the regular amount of combined water, although it was not determined.

There also occurs a dark brown limonite with resinous lustre at many points on the Company property, and especially at a point near the line between Johnson and Carter Counties, which is very high in phosphorus and can be used to great advantage in the manufacture of pig iron, to be used to make steel by the basic process, which requires a pig very high in phosphorus.

Analysis of the ore:

Metallic iron	51.66
Silica	12.37
Phosphorus	1.140
Phosphorus, ratio	2.207

Or, in other words, it will produce an iron containing 2.207 per cent. of phosphorus.

MANGANESE ORES.

A variety of Manganese ore occur on the property. At a point near the west line quite an opening has been made, exposing great masses of a dense amorphous ore, evidently *psilomelane*. There is undoubtedly here a large quantity of this ore, and the outcrop of it is found at several places over this property.

Analysis:

Metallic iron	0.60
Metallic Manganese	55.30
Silica	1.70
Phosphorus	0.221

This is a very valuable ore, being worth in Pittsburg about eighteen dollars per ton.

Another manganese ore—nodular, *pyrolusite*—found on the surfa e at several points, shows the following composition:

Metallic iron	6.93
Metal ic manganese	38.43
Silica	27.91
Phosphorus	0.287

The Iron Mountain property has not been developed at all, and, in fact, hardly examined, but enough has been seen to convince me t iat this is a very valuable mineral property.

MAGNETIC IRON ORE OF MAY'S RIDGE.

The summit of the Unaka, or Great Smoky Mountains, for the most part forms the irregular dividing line between Tennessee and North Carolina, and consequently very little, as a rule, of the lower or Metamorphic rocks occur in this State, and where they do occur it is only in a narrow band along the North Carolina State line. There is an exception to this general rule in the case of Carter County, which contains more of these rocks than any other county of this State. As magnetic iron ore is only found associated with the rocks of the lower geological formations, the consequence is, ore of this character is of very limited extent in Tennessee.

The Metamorphic rocks of Carter County are mostly gneiss, in which quartz and feldspar largely predominate, and in which but little mica occurs. Here, too, the gneiss is occasionally more or less syenitic, and also some mica slates, and, to a limited extent, talcose slates are found.

The line of demarcation between the Potsdam rocks and the Metamorphic is very distinct, a complete change being observed in a very few feet, from the dark gray limestones and red shales to the gneiss. This sudden change here, however, may be the result of a geological fault,

May's Ridge is a chain of mountains, really a great spur of the Unaka Range, extending out nearly east and west from near the North Carolina State line to the Watauga River. The Elk River enters Carter County near the Cranberry mines, which are in North Carolina, and flows nearly parallel with May's Ridge, and at the northern foot of the Ridge to its confluence with the Watauga.

The altitude of May's Ridge, as measured with a barometer, is sixteen hundred feet above the Watauga at its junction with the Elk. The Ridge is very sharp and steep, and from its sides mountain torrents roll down in narrow ravines, with sharp spurs on either side, on their way to the Elk and Watauga.

The rocks of May's Ridge dip at an angle of thirty-five degrees slightly west of south, and their strike is in the general direction of the course of the Ridge.

The East Tennessee Land Company own a large tract of land covering the top and northern slope and spurs of May's Ridge for a distance of about four miles. On this tract occurs the deposit of Magnetic Iron Ore.

May's Ridge, on this property, is composed of Metamorphic rocks, they being gneiss, in which quartz and feldspar largely predominate, with here and there a band of mica or talcose slate.

At an altitude of one thousand feet above the Watauga River the magnetic ore bed outcrops on the northern slope of this ridge. The ore-bearing rocks, as far as can be judged from the limited developments made, attain the astonishing thickness of from three hundred to four hundred feet, and the indications are that they are even thicker. There is no fissure vein, or even an indication of such a thing, but the rocks and iron ore are regularly stratified, their dip and strike corresponding with that of the rock of the Ridge.

That is, the iron ore from its line of outcrop dips into the heart of the ridge, extending down to an unknown but necessarily very great depth, evidently many, many thousands of feet.

It must not be imagined that there is on the outcrop three or four hundred feet of solid ore; such a thing never occurs; and the ore on the outcrop never shows so well as fifty or one hundred feet below the surface, but a number of pits which have been dug to a depth of several feet, show that the rocks for that distance across the strike are heavily stratified, even on the surface, with seams of ore from four to twenty-five feet thick, between which are seams of gneiss, slate and chlorite.

This belt or band of ore-bearing rocks crosses a number of the sharp spurs of May's Ridge, and often it can be traced on the surface by fragments of ore sticking out of the rock, sloping from the bottom of some gorge of the mountains up the side of the spur and over the top into the next gorge.

Numerous surface pits and cuts have been opened on this belt of ore, in all of which ore is found in varying quantity and quality, over a distance of one mile and a half along the sides and on the spurs of May's Ridge. The number of seams of ore occurring in this belt it is impossible to say or determine without extensive developments, at least much more extensive than have been made so far.

The first place opened was on the side of the ridge, one thousand feet above the Watauga. A small pit was dug about three feet deep in which good ore was struck; then one hundred feet below this a pit about six feet deep exposes four feet of splendid clean ore; below this is eight feet of soft talcose slate, and another opening exposes ore for twenty-five feet, somewhat mixed with chlorite.

No further digging has been done here, but the bottom, and possibly, the top of the ore was not found at all.

Just west of the last point mentioned a sharp spur juts out, which the band of ore crosses, and on the west side of this spur, which is four hundred and fifty feet above the branch, a still lower stratum of the ore can be traced, sloping from the top of the spur southward till it reaches the bottom of the ravine. Some men are now at work stripping off the surface here, and the ore, which is very pure, is rapidly increasing in quantity as they descend on the seam.

Further west, on Sheffield's Ridge, another spur, two openings have been made on the same belt of ore, which show very fine ore, and in which the seams of ore are thick and contain very little foreign matter.

I have made a number of analyses of this ore and append a few characteristic ones.

No. 1.—From upper four-foot opening, black ore:	
Metallic iron	48.82
Silica	8.95
Phosphorus	0.011
No. 2.—From upper opening, bluish ore:	
Metallic iron	57.47
Silica	8.76
Phosphorus	0.020
No. 3.—From Sheffield's Ridge, first opening:	
Metallic iron	63.63
Silica	7.15
Phosphorus	0.006
Sulphur	0.027
No. 4.—Surface, across hollow from Blocks:	
Metallic iron	56.28
Silica	16.93
Phosphorus	0.017
Sulphur	0.054
No. 5.—From surface near first opening:	
Metallic iron	56.68
Silica	14.02
Phosphorus	0.006

While these are fine ores, it must be remembered that the samples are from the surface, and that much better results may be expected when the seams are well opened.

The great value of the ore is due to the very low percentage of phosphorus contained in it. It will produce an iron which will contain hardly any phosphorus, and consequently will make the very best quality of steel. This iron is commonly called "Bessemer Pig," from the process by which it is converted into steel. On this account the ore of this kind is much more valuable, and brings a considerably higher price on the market than ores higher in percentage of phosphorus.

The absolute thickness of the pure ore occurring in this band of strata can only be determined by an extensive development, but it is undoubtedly great. On the surface in this character of deposit the ore is always mixed with foreign matter. In the Cranberry mines of North Carolina, about twelve miles distant, the most celebrated iron mines in the South, this is the case, the ore occurring here mixed with a large amount of foreign matter, the larger part of which is hornblend.

I am confident that on Mary's Ridge will be developed a great deposit of Bessemer ore.

Very respectfully submitted,

JO. C. GUILD,

Assistant State Geologist for Tennessee.

PRELIMINARY REPORT OF DR. KOENIG.

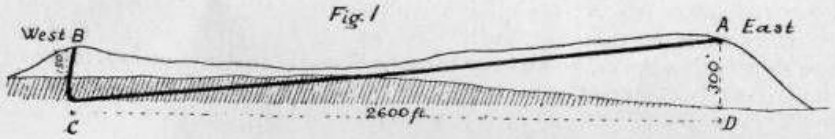
I. THE TENNESSEE RIVER IRON ORE MINES.

The body of iron ore exposed in this tract is one of the most notable that has come to my observation. It is memorable and extraordinary in three ways: First, as to quantity and quality; second, as to position; and third, as to the facility with which it can be mined. Let these three considerations be more fully explained.

1. QUANTITY AND QUALITY.

I had no time to measure the length of the outcrop, but after having gone over it, partly on foot, partly in carriage, or locomotive, I take confidently Mr. Roberts' statement that the length of the outcrop on the Company's property is 28,000 feet—say five miles. This outcrop appears in the eastern and western crest of a double hill running due northeast to southwest The range is cut transversely by Hackler's Gap and Eureka Gap, three miles apart. These gaps are like trenches and expose the position of the ore body, so that an estimate may be made of the quantity of ore present, or in sight. The natural facilities thus offered are increased by the mining operations that have been conducted in both gaps for some time. In figure 1, following, I have represented a section of Hackler's Gap. Mining is done at

Fig. 1



present near the eastern outcrop at A, and a few hundred yards further up the gap to the eastward, where the bed lies only about fifty feet above the water line of the creek. This latter is indicated in the sketch as the top of the shaded area. At the point A, the dip of the bed was found 14°—15° to southeast; the height of point A is 300 feet above the valley. From A to B the distance is 2,600 feet. The bed is indicated by the heavy line; only a small part of it is below the water line, and the deepest part, under B, is probably not over 100 feet below the water line. This is a most material point, since the quality of the ore lessens with the depth below the water line. It must likewise be understood that the section of the bed is not actually such a straight line, as the sketch might imply. but that it is an undulating line. Yet the undulations are so slight that, in such a small scale, they do not show beyond the straight line. For the purposes of a rough calculation we can take the length of the heavy line A C as equal to the base line C D, because the cosine of 14 degrees is nearly equal to unit. I found the thickness of the ore bed in the workings at Hackler's Gap to average seven feet. The workings at Eureka show up similarly. For the quantity of ore we get, therefore, in the flat portion of the bed from A to C

$$\frac{28{,}000 \times 2{,}600 \times 7 \times 192}{2{,}000} = 48{,}921{,}600 \text{ tons.}$$

or round 49,000,000 tons.

For that part of the bed standing nearly vertical in the eastern section, I assume an average thickness of five feet, inasmuch as this portion is only exposed in the Eureka Gap for a vertical height of about sixty feet. Two thousand feet of this part of the bed are cut out by a neighboring property; we have, therefore,

$$\frac{26{,}000 \times 250 \times 5 \times 192}{2{,}000} = 3{,}120{,}000.$$

or round 3,000,000 tons; together 52,000.000 tons.

I estimate that of this sum five per cent. has been lost by the destruction of time in carving out the gaps and brook beds. Also, that 20 per cent. will be lost in mining. (Under the last head it will be shown that this much need not be wasted, if the proper methods are followed.) But taking this percentage as unavailable, there remain forty million tons of ore in sight.

QUALITY OF THE ORE.

At the east workings, on the brow of the hill, the vein is exposed by a trench uncovering the outcrop and several small adits or tunnels. The ore is, at this place, of dark brown color, porous and soft, easily friable. In some places the iron is more compact and harder, with a reddish color. This hard ore is at present rejected, as not suitable to the use of the customers. From theoretical considerations, into which I shall not enter in this preliminary report, I consider it as highly probable that the greater part of the ore mass will prove of the brown, friable kind. This latter is of higher grade. I collected a sample at the point A, comprising seven pieces of nearly equal size and broken off from the face of the ore body at a foot of vertical distance each. The following is an analysis, made by myself, of this average sample:

Sesquioxide of Iron	(Fe^2 O^3)	67.90
Alumina	(Al^2 O^3)	9.81
Manganese Oxide	(Mn^2 O^3)	9.54
Lime	(Ca O)	0.27
Magnesia	(Mg O)	0.63
Phosphoric Oxide	(P^2 O^5)	1.07
Sulphuric Oxide	(S O^3)	*None*
Silica	(Si O^2)	9.44
Water	(H^2 O)	9.92
		99.60

This ore is notable for the high percentage of alumina, which even slightly exceeds that of silica. In my full report I shall detail the significance of this fact. The ore will yield metallic iron 47.52 and make a pig iron containing .094 per cent. of phosphorus. Two tons of the ore will make one ton of pig iron, of medium gray quality. I will show (in full report) that the hard ore, which is not shipped at present, forms a natural flux for the high grade ore. A sample of it yielded 27.3 per cent. of metallic iron, 5.7 of silica, very little alumina and 25.0 per cent. of lime. Two tons of high grade would flux with one ton of low grade, without the addition of limestone or any other flux. The successful introduction of the basic Bessemer steel process would make these ores much more valuable than they are at present. This ore will, if properly managed, be reduced with a minimum of coke, and a blast furnace of good construction will make as much pig iron in twenty-four hours from it as it will from the high grade magnetic or hematite refractory ores. This ore body is very fine; it has not an equal from Canada to Alabama.

II. ITS POSITION, TOPOGRAPHICAL AND GEOLOGICAL.

The tract is on the northeast, bordered by the Tennessee River, and occupies one of the numerous ridges so characteristic of the Appalachian chain of hills. Geologically the ore body belongs to the Clinton Formation, which is the lowest member of the Niagara group of rocks. It is known from Central New York to Alabama either as a red sandstone or as a limestone strongly impregnated with the oxide of iron. In some localities the iron replaces the lime more or less completely and then constitutes a body of iron ore. Your deposit on the Tennessee is one of these localities. Experience shows that this form of iron ore is always of the highest grade near to the surface of the earth; or, more generally speaking, above the water level of the surrounding territory. The explanation of this fact may be thus given:

The carbonate of calcium or lime is soluble in water to a slight extent. But as this action is going on all the time, an astonishing amount of lime is carried off in the aggregate. The analysis given above shows that the lime has been removed up to a few hundredths of one per cent. The nearer to the surface of the soil, upon which the fresh water precipitates from the air, and the higher above the drainage level this action proceeds, the more powerful it will be, therefore. Now, we have seen above that the position of this ore bed lies to the extent of two-thirds, more or less, above the drainage level and close under the surface. All conditions were thus favorable to wash out the lime, and my statement that probably the great mass of the ore will be of the high grade kind is more fully supported.

At one time in the early history of this Clinton formation the whole bed was limestone, with no iron. This is inferred from the observed fact that the iron oxide appears in the form of whole and fragmentary shells of bivalves, of snails and sea-lilies. But we know of no animals producing shells of other mineral matter than lime and silica. The iron must have come in at a later period by infiltration, taking the place of the lime, after the bed, forming the ocean bottom before, had become dry land. It remains still a mystery to science whence the iron solutions came that acted in these Clinton limestone beds so uniformly as we observe on the long line from Canada to Alabama.

The fossil ore bed lies upon a thickness of about 300 feet of shaly sandstone, which represents here on the Tennessee the whole of the Medina and Hudson River Rocks. These latter are

very thick in Pennsylvania and New York, the Medina alone exceeding what here stands for both. The foot of the hill toward the east shows an outcrop of blue limestone, which Dr. Safford and myself identified as Trenton by means of the characteristic fossils we observed. The same close proximity of the Trenton limestone and the Clinton red ore, we had occasion to observe later at the Little Emory Gap. There was no evidence to assume the existence here of a fault any more than at Hackler's Gap, by which the Clinton and Trenton were brought nearer together at the surface. The Trenton limestone appears of good quality for use in the furnace.

The ore bed is overlaid by slates, which are much weathered and softened. At the outcrop A, a parting of the same kind of slate divides the ore bed into two benches. Lower bench, 28 inches; slate, 20 inches; upper bench, 57 inches. The slate covering is in many places only a few feet thick, but its average thickness is probably not much less than 100 feet.

III. FACILITIES FOR MINING.

These are nearly ideal. Several millions of tons of the high grade ore can be removed by open quarry work, after stripping the few feet of surface slate. It is purely pick and shovel work. The upper bench of the ore bed is so thoroughly washed out that it is spongy and crumbling. It yields to the shovel almost like gravel. The general elevation above the valley makes all hoisting or pumping unnecessary. The cost of mining this portion of the body should not exceed twenty-five cents a ton. Transportation to the river is by natural gravity. No washing or cleansing of the ore is necessary, nor would it improve the grade of the ore. After those portions of the bed which can be stripped have been exhausted, the cost of mining will be considerably higher and may be estimated at fifty cents a ton. Because, in order to get the whole ore, the panels or chambers must be filled with gob, that is, rock brought in from the outside; for each ton of ore taken out, two-thirds of a ton of rock must be hauled in and piled into the emptied space. No ore pillars remain in the mine by this method; the waste remains below two per cent. The ore may be robbed by the pillar system at a very heavy ultimate sacrifice. And for this there would be no reasonable justification except excessive greed.

I was pleased with the present mining operations. They have been located judiciously in the two gaps, and the method of stripping has been properly followed. For large shipments the work would have to be more systematized and the points of attack increased, without changing the general methods.

In conclusion, I can simply congratulate your company for their possession of this magnificent property, which could supply the United States with iron for ten years at the present rate of consumption. In connection with the close proximity of the coal in Walden's Ridge, I do not hesitate to make the assertion that iron can be made here at a greater profit than in Birmingham, because this place is 200 miles nearer to the markets.

GEORGE A. KOENIG, PH. D.

REPORT OF DR. J. M. SAFFORD.

TO THE PRESIDENT AND DIRECTORS OF THE EAST TENNESSEE LAND COMPANY:

Gentlemen:- Below please find my report on the Coal and Iron-ore lands of your property

The report is based *First*, Upon recent examinations of portions of the property; *Secondly*, upon surveys made by myself in former years, and *Thirdly*, upon such data as I have from other reliable sources.

The recent examinations referred to were made in company with Dr. G. A. Koenig, Professor of Metallurgy in the University of Pennsylvania, who, it is understood, will present a separate report. There were also in the party Mr. J. C. Guild, and Mr. W. Dickerson, Civil and Mining Engineers and Chemists, of Chattanooga. Messrs. Guild and Dickerson were already familiar with the property, and their aid and guidance were indispensable.

EXTENT OF PROPERTY.

According to the information I have received, your property is a great territory, to be measured by square miles rather than by acres. Beginning with the borders of Putnam and White Counties, on the west, it extends easterly quite across one of the grand natural divisions of Tennessee, the well known Cumberland Table-land or mountain, and beyond this, reaches into another grand division, the great Valley of East Tennessee.

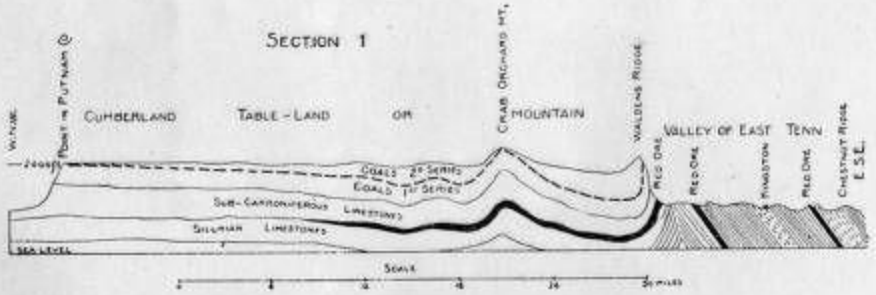
The Mountain, along the latitude of your lands, averages forty-five miles across; measured directly, that is, southeasterly or northwesterly, it is about thirty-six across. On it, besides parts of Putnam and White, your property embraces large parts of Cumberland and Morgan counties, and ten miles of Walden's Ridge, in Roane county, that remarkable ridge which gives to the Table-land its sharp and crested eastern margin.

To the east and southeast of Walden's Ridge lie such of your lands as are properly within the Valley of East Tennessee.

The whole property is said to aggregate approximately, 300,000 acres, equal to 468 square miles, the great body of which is either valuable coal or iron-ore land.

GENERAL FEATURES.

The following sections, 1 and 2, leaving out minor details, will serve to illustrate, in a



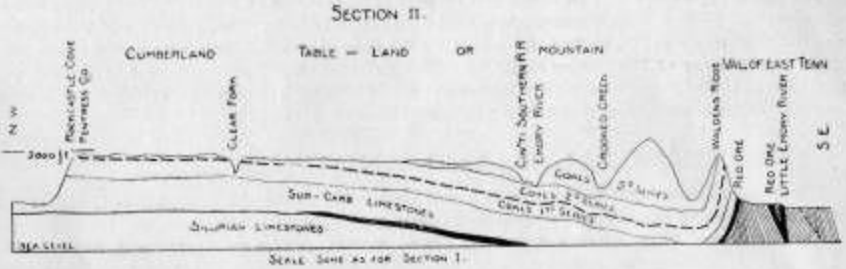
general way, the topographical and geological characteristics of the country in which your lands lie. They extend, the one east southeast and west northwest, and the other southeast and northwest, quite across the Table-land or mountain, and beyond this a number of miles easterly into the great Valley. Section 1 runs south of Emory river; Section 2, north of it, and both through large areas of your lands.

From these sections or diagrams the Cumberland Mountain region is seen to be in the main a great table-land, rising with bold escarpments from 600 to 1,000 feet above the valley lands on each side. Its western portion is nearly 2,000 feet above the sea, and indeed at some points quite

this. In this portion also, as well as in the middle part, the plateau character is well marked, wide, level and wooded areas reaching out in all directions for miles. In the eastern portion, this character is not always so evident. One encounters more hills and ridges. There is, too, an evident sinking of the mountain mass in that direction.

In Section 1, Crab-Orchard Mountain and Walden's Ridge, both notable features, are intersected, the first due to a great upward bending of the strata, the second to a similar up-bending, but a more abrupt and faulted one. These ranges run with the general direction of the table-land and, for that matter, with the trend of the whole country, to the northeast and southwest. The various formations indicated by the lines are named, and in good part explain themselves. They are enumerated below.

In Section 2 we have much the same topography, excepting that there occurs a greater fall in the floor of the mountain as we advance southeasterly. Upon this sunken floor, however, a



very considerable mountain and many ridges rest. These are represented provisionally and by two elevations only in the section. Their true number, outlines and relative positions remain to be studied out. Walden's Ridge is intersected as in Section 1, and presents much the same structure. It differs in being more isolated, a deep valley cutting it off from the mountain back.

In both sections the formations are the same and are, in descending order, as follows:

First. The Coal Measures, everywhere the top part of the mountain and, in the region of Big Emory river, and north and east of this, the whole visible mass of it. Thickness ranging from 200 to 2,000 feet or more. In Section 1 the coal measures are represented as divided into parts, 1st series and 2nd series; in Section 2 into three parts, 1st, 2nd and 3rd series.

Second. The Sub-carboniferous Limestone 1,000 feet thick, more or less; especially prominent along the western escarpment of the mountain.

Third. The Devonian Black Shale of limited thickness, 50 feet or thereabouts, but always present in its proper horizon.

Fourth. The Clinton Formation (Upper Silurian), from 50 to 300 feet thick. In this are the strata of red iron-ore. Represented in the sections by the dotted bands. Does not appear west of the mountain.

Fifth. The Hudson River and Trenton Formations (Silurian) at the very base.

Of these formations we are concerned chiefly with the Coal Measures and the Clinton.

WALDEN'S RIDGE.

This has been mentioned several times and its place in the sections indicated. But as ten miles of it lie within your territory, it demands special notice. The Ridge contains several seams of coal; its strata, including the coal, have an unusual and remarkable position; it has also important relations to certain seams of iron-ore. Furthermore, its topography is such as to cause it to have no little bearing upon the accessibility, mining and transportation of the coal in the body of the mountain lying back of it. And I might add that it has, more than any other part of the Cumberland, given direction to the lines of travel and traffic of the country, the common roads of older date and the roads and railroads of to-day.

The Ridge is a great bulwark, guarding effectually the mountain mass in its rear, and only allowing access through certain and but few water gaps—natural gateways we may call them. As already stated, Walden's Ridge is the southeastern edge or margin of the mountain, a margin remarkable for its straight or slightly and gracefully curving southwesterly and northeasterly course.

North of Big Emory Gap, as indicated in Section 2, it appears for miles as an isolated, dis-

tinct ridge. South of the Gap it soon fuses or blends more or less, by its western face with the main body of the mountain, though even here it is marked out by the line of its more elevated crest. Whether isolated topographically or not, I make the Ridge a part of the Cumberland, for the reason that all its strata are those of the Cumberland and continuous with them. The strata belong mostly to the Coal Measures, and it is the up-turning of these along their southeastern edges that resulted primarily in the making of Walden's Ridge. The great sheets of hard sandstone included in the measures have been bent up, coal and all, often to verticality and sometimes beyond this, turned over in fact, by forces and pressure acting from the southeast.

The southeastern face of Walden's Ridge is a precipitous escarpment, a wall, and its high crest towers above and overlooks the Valley of East Tennessee, the views in clear days only limited by the cloud-capped mountains of North Carolina.

Reference to Sections 1 and 2 will aid in understanding the Ridge and its topographical and other characteristics and relations.

The water gaps referred to above are profound intersections of Walden's Ridge, cut out by streams in their escape from the mountain region into the Valley. There are two of these gaps, four and a half miles apart, or five and a half by the course of the Ridge, within your property, the gaps respectively of Big Emory and Little Emory rivers. The first gives passage to the Cincinnati Southern Railroad, which here leaves the mountain and enters the valley, changing at the same time its course from a southerly to a southwesterly one.

THE COAL SEAMS AND THE COAL.

The whole Cumberland Table-land is a coal field. The mountain everywhere is either substantially made up of Coal Measures or else heavily capped with them.

The Measures have been divided, as above stated, (see also Sections 1 and 2), into three series, the first, second and third, or the lower, the middle and the upper. The division has been introduced here with direct reference to your lands. It applies well to the part of the Coal Measures or, what is practically the same, to the part of the mountain in which you are interested. It will enable us the better to discuss and locate stratigraphically the coal of the exposures already known, and to calculate probabilities as to the existence of beds, and a wealth of coal as yet unseen.

The first series embraces the sandstones, shales and coalbeds lying as a group below what is known as the great conglomerate. This is an important coal horizon and is coextensive with the area of the mountain. It holds beds of coal of great value.

The conglomerate is a heavy, persistent sandstone from 50 to 150 feet thick, and is usually charged with small white pebbles. It is represented in sections I. and II. by the broken line between series first and series second. It makes the floor of the Table-land in much of Fentress, Putnam and White counties with nothing but the thin soil to cover it. In other parts of the mountain it is buried beneath overlying strata, sometimes very deeply, but is always to be found in its proper place in the series. It is the most important plain of reference in the Coal Measures.

In this series are the Bon Air Mines of White County, to which a railroad has been built, and from which Nashville receives one of its most popular coals. There are here two workable beds and two thin seams of coal in a thickness of ninety feet of Measures, all between the conglomerate and the limestone. Beds of the lower series occur also in Putnam County. In Fentress County in the same series, and like the others on the borders of your lands, a heavy bed of coal ranging from four to five and a half feet in thickness is known to underlie very many square miles of territory. The coal is a block coal, free burning, flaming, and of high grade for domestic and manufacturing purposes. It is hardly a coking coal, but much of it could be used in the raw state with coke in manufacturing pig iron. Besides this main bed others exist of less importance, but often locally workable. The main coal is so highly esteemed that a railroad is now in process of building to reach it and bring it to Nashville.

To the south and west in the State this series is also found to be a notable horizon of coal. The "Main Etna" in the Raccoon Mountains, southwest from Chattanooga, and the coal of many mines in Marion county are examples. The Main Etna for a long time supplied the markets with coal and coke in great quantities. But it is not proposed to dwell upon examples in the more distant parts of the State.

It is to be noted that the coals of White, Putnam and Fentress Counties, mentioned above and pertaining to the first series of the Coal Measures are on the borders of your lands. Now, as this series, with its cover, the conglomerate, doubtless extends under every mile of your mountain territory, it is but fair to conclude that it carries with it in such extension the coals which it shows in the above border regions.

An exposure of the lower and middle series of the Coal Measures, the first and second, is to be seen in the gap of Crab Orchard Mountain, through which the line of the old Nashville and Knoxville stage road runs. The gap is east of Crossville, in Cumberland county, and was a famous place in the bygone days of staging. It thoroughly intersects the formations and the great fold (anticlinal) uplifted in the making of Crab Orchard Mountain. (See section 1.) Series first is well exposed between the limestone and the conglomerate with a thickness of more than 200 feet. Its sections show much shale, with indications of several beds of coal. It came under my observatian many years ago. Whether any coal of value has been of late years developed here I am not informed. The exposure is interesting in that it proves the presence of the strata of the first series many miles within the limits of the Cumberland and in the southern border of your possessions.

It is not asserted that any one of these coals is probably of uniform thickness or workable at every point beneath your lands. They doubtless have their thin places, as they have in regions where best known. But we have reason to believe that such thin places are exceptional and that the general prevalence of thick and good coal is the rule. In Fentress County, where these coals have been best studied, two areas holding the heavy coal of that county are known, one of which is estimated to contain thirty square miles and the other sixty. And these are separated by only a narrow strip of unproductive territory. The data for these estimates were derived from natural outcrops, and where these failed from the *borings* of the drill.

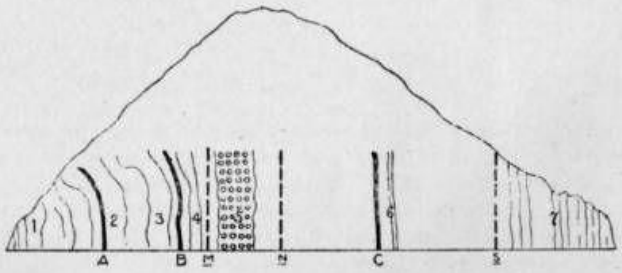
Advancing from the west or north, these lower coals on your property lie at first at no great depth below the surface; but owing to the easterly dip of the formations, the depth increases until they are deeply buried, conglomerate and all, beneath the superior strata of series second, and over much of the territory still more deeply by those in addition of series third. In this we except the denuded parts of the Crab Orchard Mountain fold in Cumberland County. See above.)

But we have further and important data to justify the conclusion as to the extent of series first with its coals. There is an actual outcrop of its strata and coals in a long line on your property, and in such a part of it as to convince one, in connection with the facts already given, that they underlie in place the whole of your mountain possessions from west to east and from north to south. This line of outcrop is along the southeastern face of Walden's Ridge, the extreme southeastern edge of the Coal-Measure Mountain. Thus it follows that the first series and its coal are brought to the day on both sides of the great Cumberland area, conditions significant as to what is buried between the limits.

We owe the eastern outcrop to the same great upheaval which originated Walden's Ridge; in fact, the rock strata and coal of series first and series second are, in many parts of its course, the ridge; bodily and structurally. In this upheaval the strata, sandstones, shales and coals were turned up, "brought up standing," from depths below and their edges exposed along the sides and crest of the ridge.

I give below, Section III., a representation of the coal beds seen along the Cincinnati Southern Railroad in the Big Emory Gap. It begins at the south end of the bridge on the south side of the

SECTION III.



Big Emory River and extends 250 yards, roughly estimated, quite through the range of Walden's Ridge at this point. It is but a diagram, only intended to exhibit the number and sequence of the coal beds so far as seen. The strata are shale, sandstones, the conglomerate and coal. Tney are approximately vertical. The shales and coal are considerably crumpled and rolled. The sandstones are much less so, though bent and kneed to some extent. The places of two of the strata respectively are to be noted, that of the conglomerate and that of the great sandstone at the north end. These are plains of division and of reference. All the strata south of the conglomerate pertain to the first or lower series of the Coal Measures; all between the conglomerate and the great sandstone, which I name the Emory Sandstone, to the second or middle series.

There are three coal seams to be seen in this section. Their places and positions are indicated by the black lines at A, B and C respectively. Coals B and C are the most important. The small letters, m, n and s indicate approximately places where other seams may exist. The numbered spaces are sandstone strata, including the conglomerate, No. 7 at the north end being the Emory Sandstone. The remaining spaces represent shales or covered spaces.

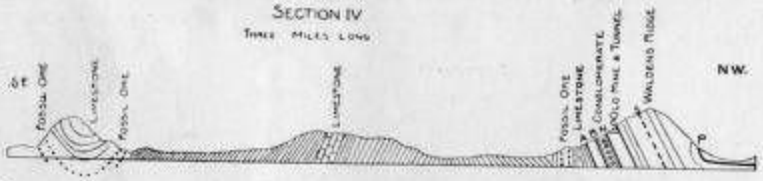
The next above, B in the section, has been mined and its coal sought for and used. A tunnel starting under the railroad runs into it far enough to show a good face of lustrous coal, with a thickness varying from two to eight feet, the average being probably about five. Like most of the coals of Walden's Ridge, this bed has been involved in the great uplift, and so squeezed and crushed between adjacent strata as to be nearly pinched out in places, and rolled into great masses at other places; hence the variation in thickness. The following are analyses of specimens of this coal taken from the mine. They were made by Messrs. Guild and White, Civil and Mining Engineers and Chemists of Chattanooga. No. 1 is from the upper level, and No. 2 from the lower level heading.

COAL	1	2
Hyg. Moisture	1.14	1.69
Volatile Matter	35.92	33.57
Fixed Carbon	61.52	61.95
Ash	2.32	2.79
	100.00	100.00
Sulphur (det. sep.)	1.005	0.613
COKE		
Fixed Carbon	96.38	95.69
Ash (light red)	3.62	4.31
	100.00	100.00
Sulphur (det. sep.)	0.852	0.656

The analyses show little ash and no excess of sulphur, and the relative percentage of fixed carbon is above average. They indicate a superior coal. How it may be when further penetrated and experimented upon in quantity, as to purity, heating power and coke making, remains to be seen.

Passing northeasterly to the vicinity of the "old mine" on Walden's Ridge, a point about three and two-thirds miles, air line, from Big Emory Gap, and about a mile southwest from Little Emory Gap, we find other exposures of these lower coals. The mine referred to is in a coal of the second or middle series, and is located on the southeast face of the mountain and but little below its summit. The lower coals outcrop at points further down the slope.

Section IV., herewith given, intersecting Walden's Ridge at the point of the old mine and



extending out southeasterly two miles into the Great Valley, exhibits the number and position of the coal beds so far as recognized in this region, as well as the places of the seams of red or fossil iron ore. Two of the seams of ore outcrop at the foot of the mountain, the others a mile and a half away in the valley. Both coals and ores are within the bounds of your lands. The section is a reduction of one originally constructed (1871) by my friend, Prof. F. H. Bradley, an accomplished geologist, whose memory I cherish and delight to honor. Although having antedated him in a visit to this region, yet I am indebted to Prof. Bradley for details which have been of much service.

As at Big Emory Gap, so here the conglomerate divides the lower or the first series of coal measures from the middle or second series. In the lower series two coals, A and B, are shown. A has been entered a short distance on its outcrop. It was seen to thicken rapidly to eighteen inches of good coal, but water interfering, the work was abandoned. B may be seen in outcrop fifteen feet below the conglomerate and by the side of the old incline. Only a line of coal appears, a local disturbance having cut off the bed. These statements as to coals A and B are taken from Prof. Bradley's report. As to whether any proper examination of the beds has been made in recent years I am not informed. A tunnel run in from the southeastern base of the

mountain (and this has been proposed) would test them, and, if extended far enough, give easy access to the higher and main coal of the section considered below.

These lower coals, although showing little in outcrop, may, when thus properly explored, prove to be beds, either one or both, of great value. They doubtless correspond to the lower coals of the Big Emory section, A and B of the one to A and B of the other. Taking the two sections together, it would appear that these sub-conglomerate coals are continuous along the ridge. From what we have seen at Big Emory, B will most likely prove to be the better bed. From its stratigraphical position it may be referred to the Main Ætna of the Raccoon Mountains.

This ends all I have to say as to the lower series of the Coal Measures, the sub-conglomerate coals. It is evident enough that we have here a horizon holding a vast wealth of coal of good quality and available over large areas. Mined at many points in regions near your property and elsewhere in the State, it is one among the sought for resources of supply for towns, cities and furnaces. Extending everywhere under your mountain lands, it has special interest for you and cannot be regarded otherwise than as an important factor in any estimate of the high value to be attached to them. Within much of your territory its coals will doubtless be found within easy reach of the surface; over much of it they lie below water level, deeply buried beneath superincumbent strata. But even here they are a reserve of fuel to be relied on when superior and more easily accessible beds shall have been exhausted, if such exhaustion can at all be considered.

The second series, or the Middle series of the Coal Measures, next claims attention. This is often called the Sewanee horizon, and its principal coal the "Main Sewanee." The series exists nearly as extensively over your mountain territory as the one we have considered. Its importance is greater. It contains the most valuable bed of coal, considering extent, character of coal, persistency and accessibility, to be found in all the Coal Measures of Tennessee.

Sections I. and II. illustrate the occurrence of series second upon your lands, as well as its relations to the other series and to the whole mountain. To the north and west of your property, and at points upon its very borders, this series, with all above it, has been swept away leaving the denuded conglomerate as the surface rock. (See page 58.) Advancing, however, southerly and easterly, the conglomerate, as before said, dips away, and strata of series second soon come in and make the surface, to be themselves in turn covered by those of series third. This makes clear the prevalence, with the very limited exceptions along the northern and western borders, of series second within your mountain lands.

In considering the coals of this series I shall first refer to developments in the southern part of the State, where the long existence of railroads has greatly stimulated enterprise in the way of coal mining.

The typical section of the second series, or at least one which has been regarded as typical, is seen at Tracy City, in Grundy County, a point on the southwestern part of the Table-land, or, as we can as well say, Coal Measures. The series is here about 240 feet thick, measuring from the conglomerate below it up to a sandstone which covers it, and that is, furthermore, the cap-rock of many of the flat-topped ridges of the country around. The section at Tracy, besides the usual shales and sandstones, shows four coal seams, great and small, all lying in a horizontal position. The lowest of these, but little above the conglomerate, has only local importance. It has been mined at other points not far distant. It rarely swells to a thickness of three feet. Winchester and other towns were once supplied with coal from banks in this bed. Next above and fifty-five feet above the conglomerate is "The Main Sewanee," the highly valued bed of the series. The bed ranges in thickness from two to seven feet, with an average of nearly four. It is very largely mined and over a number of square miles. Much of the coal is sent to Nashville and other towns in the raw state, but most of it is converted into coke for iron furnaces. Above the Main Sewanee and near the top part of the section are two other coals. They are but thin seams, as seen here, and need not be noticed.

In the region of the Etna mines, in Marion county, the second series is rich in coal, there being three beds in a thickness of a hundred feet of measures, which at the point examined aggregated more than ten feet of good coal.

We find in the Tracy City and Ætna or Raccoon Mountain coals examples of what this second series of the Coal Measures may yield. Other localities in southern Tennessee throw light upon it as a horizon of coal. But for want of time we forego notices of these and pass northward, nearer home.

Approaching your lands in White county, good coals, four to five feet in thickness, are known, which doubtless pertain to the Main Sewanee horizon. In Cumberland county, south of Crossville, I have seen banks six feet thick which were referred at the time to the same horizon though with hesitation.

In an appended note, an exposure of the strata of series first and second in the gap of Crab Orchard Mountain is described. The section of rocks seen in this vicinity begins in reality west of the range of the mountain, and it here gives us a coal,, separated by forty feet from the conglomerate, which doubtless is of the same Sewanee age. It had been mined when seen and was known as Haley's bank. The coal was of good quality and four feet thick.

A railroad built across this part of the Table-land, in White and Cumberland, would greatly stimulate exploration and open coals and coal beds now dormant or unknown. Such a road ought to have been built long ago.

The elevation of the strata in Crab Orchard Mountain and their subsequent erosion at the gap give a rare opportunity for the study of the lower and middle coals within the bosom of the Table-land. Elsewhere north and northeast of this they are too deeply buried for natural exposures or superficial banks, even in the canyon-like valleys such as that of Big Emory River. But while little or nothing can be seen here, everything has been turned up to the day in Walden's Ridge, along the very southeastern margin of the great mountain coal-field. The strata are there for our study, and more satisfactorily and comprehensively presented than they could be through any work of the drill. But much of this has been stated substantially before (See page 59.)

That series second with its coals outcrop in Walden's Ridge has been anticipated. The discussion of series first has in a measure involved that of the second. All the sections from I. to IV. inclusive show the outcrops of both. One of the coals of series second, and the most prominent one outcropping in the Ridge, can well claim to be the main Sewanee. It is a highly important coal in this region, as elsewhere. It is seen at intervals all along the Ridge within your boundaries, is the coal of Rockwood and of many other points in the same range far to the southwest.

As argued before in [illegible] case of series first (page 59), this outcrop along Walden's Ridge, together with what [illegible] know of the series in White, Cumberland and adjoining counties, goes a long way towards proving that the series second, as a productive coal horizon, underlies the whole of your territory, only excepting the limited western areas referred to on a preceding page.

Section III., page 59, it will be recollected, illustrates the series of strata along the C. & S. Railroad in Big Emory Gap. The coals A and B belonging to series first have been noticed. The bed C is referred to the main Sewanee.

An excavation or short tunnel has been made in it at a point a short distance above the railroad track. The bed, like most of the vertical or highly inclined ones in Walden's Ridge, is irregular in thickness, varying from two to eight feet, with an average of about five so far as seen The analysis of the coal is given in the table following. (Pages 21 and 22.) The small letters, *w*, *s* and *x* indicate places where other coals may be searched for, the outcrops of them not appearing. The one (*s*) located first above the conglomerate corresponds to N in section IV., and has the place of the Lower Sewanee.

On Walden's Ridge, within a mile and a quarter of Little Emory Gap and to the southwest of it, are several exposures of the coals of series second. These have elevations of from 700 to 850 feet above Big Emory River at its nearest point. Two of the localities of the exposures were visited by our party and the coals examined. One is at the "old mine," which, with the whole ridge, section IV., is made to intersect. The section shows the conglomerate with series first below and series second above. The coals of the first have been already noticed. (Page 60.) The most important bed in the series above the conglomerate, an excellent coal and referred to the Main Sewanee horizon, is C of the section. The "old mine" is in this. For twelve years or more nothing has been done here. Previously there was considerable activity. A tunnel, beginning ninety-six feet below the outcrop, struck the coal at 210 feet. From this levels were driven and several rooms opened. The coal was lowered from the mouth of the tunnel over an incline 1000 feet long, then hauled in cars on a narrow gauge road to the river. The dip of the coal in the mine is 59° to the N., 30° W. Prof. Bradley says of the mine: "It is now (1871) yielding large quantities of very superior coal." The bed "averages more than four feet in thickness. In one place it falls to three feet, while in many it reaches five and six." The "coal having been less disturbed than at Rockwood, has largely retained its laminar condition and does not, therefore, make any considerable amount of slack when properly mined. The strength of the coal enabling it to resist breakage is much in its favor." Our party could not enter the mine on account of water in the tunnel, but we saw an exposure of the coal above the tunnel which was very satisfactory as to its thickness and general appearance. It impressed us as being a bright, superior coal. Allowing for some displacement on one side it was here five feet or more in thickness.

The other locality visited was several hundred yards to the northeast and nearer Little Emory Gap. Here the same coal as that just described appears in an outcrop six feet thick. Though considerably weathered, it presented a most favorable face, indicating a coal similar to that of the mine and fully equal to it.

This main bed of coal has been followed along the Ridge to Big Emory Gap. Its outcrop in the course changes its position with reference to the summit of the Ridge, at times, approaching and then receding. It changes in dip also from 30 to 80, the average being 60.

Below are three analyses of the coal of this bed and one of a higher coal, a member of series, 3d.

The first, 1, is coal from C in the section along the railroad in Big Emory Gap, by Messrs. Guild & White, of Chattanooga.

2 is from the "old mine" on Walden's Ridge, C in section No. 2.

3 is from the same "old mine" and made by Dr. T. G. Wormley, at the time a resident of Columbus, O.

4 is from a bed northwest or back of Walden's Ridge, a member of series 3d.

COAL.	1	2	3	4
Specific gravity			1.308	1.383
Hyg. Moisture	1.62	1.90	1.50	1.50
Volatile matter	30.83	28.34	27.70	30.10
Fixed Carbon	63.01	63.11	63.10	65.80
Ash	4.52	6.65	7.70*	2.60*
	100.00	100.00	100.00	100.00
Sulphur, (det. sep.)	0.942	0.9	0.53	0.71
COKE.				
Fixed Carbon	93.30	90.46		
Ash	6.70	9.54†		
	100.00	100.00		
Sulphur, (det. sep.)		1.025	1.45	0.52
Permanent gas per lb. in cu. ft.			3.172	3.32

*Ash—Light fawn color.
†Ash—Dark red.

The first three are the analyses of the main bed. They are much alike in volatile matter and fixed carbon and approximately in other particulars. Dr. Wormley says of the coals 3 and 4, the latter, as stated, a coal of series 3d—"These are the best coals we have yet analyzed, at least so far as Ohio coals are concerned." It is suggested that the high percentage of fixed carbon and the fact that the coal softens very little in the fire shows it would be a fine fuel in the raw state for iron furnaces. The sample sent to Dr. Wormley was a full section of the bed cut from roof to floor. The entire product of the mine is stated to have been noticeably free from sulphur in the form of pyrites.

Below the main coal of this part of Walden's Ridge and just above the conglomerate are outcrops of coal N of section IV.

This, as stated, corresponds to *n*, of section III, and is referred to the Lower Sewanee. An outcrop of it is seen at the mouth of the tunnel of the old mine. Limited examinations once made here gave evidence of a variable bed from two and a half to four feet in thickness of good coal. Whether any further developments have been made of late years I cannot say.

At *z*, above the old mine and between that and the summit is the supposed place of still another coal,

The 3d series of Coal Measures remains to be considered. This is a great body of measures, resting wherever occurring necessarily upon series 2d as that does upon series 1st. In geographical extent the series is found over less of your territory than the others. The part of it within which lands of yours lie (as I understand them) is cut by the Big Emory river and the Cincinnati Southern Railroad from a point near Sunbright to Big Emory Gap. From this portion of the Emory and of the railroad, as a base, it extends east and northeast, including the region about Wartburg, the Valley of the Crooked Fork, and the country around the head waters of Little Emory as far as to Walden's Ridge. And from the same base it extends southwesterly towards Crossville and Crab Orchard Mountain in Cumberland County, and in the direction of the

northern border of Rhea. Walden's Ridge, or that portion of it extending from a mile southwest of Big Emory Gap to a point nine miles northeast of the Gap, is its southeastern limit.

In the area thus outlined, which may be called the *Emory region*, series 3d often presents a great thickness of strata, reaching indeed at points in the mountains north of Big Emory a thickness of 1,200 feet or more, containing also many beds of coal of greater or less value. Passing from the northwest to the southeast, as has been said before and illustrated in section III, there has been a great fall or drop in the mountain. This has thrown the conglomerate and both series 1st and series 2d, more or less deeply below water level, and furthermore has saved the higher strata from denudation.

So far as my knowledge extends, the coals of series 3d in the Emory region have been comparatively little studied. It is largely an unexplored region. That it contains not a few workable coal beds, as yet unknown, there can be no question. The region is the southwestern extension of the mountains not far off in Anderson and Campbell counties which are rich in coal containing many known seams, with from at least six to eight of them workable, and ranging from three to five feet in thickness. Among the latter is the bed so extensively worked at Careyville, Coal Creek and Poplar Creek. Now these are all coals of series 3d, and your region is geologically part and parcel of the region there. There is one difference. In the counties mentioned some of the mountains rise up very high and are capped off with strata which your highest lands are not sufficiently elevated to reach. Nevertheless the latter rise enough to take in the lower and middle coals of the more northern mountains, and such a coal for example as that at Poplar Creek and Coal Creek. Although not as well explored as we trust it soon will be, yet the Emory region has its coal exposures and outcrops. Back of Walden's Ridge, in the vicinity of the Little Emory Gap and of the "old mine" are hills and mountains which show outcrops of five or six beds of coal. The outcrops have no great thickness but the beds remain to be explored, at least the most them. When this is done some will doubtless develop heavy and valuable coals.

In the Valley immediately back of the Ridge, and in the vicinity of the line dividing Roane and Morgan Counties is one of these beds (P. Section IV), the coal of which has deservedly a good reputation. This is the coal (4) the analysis of which by Dr. Wormley is given in the table on page 63. It has been popular in Kingston as a domestic coal and for smithing purposes. In the valley where mined, however, it lacks real desirable thickness. It is said to occasionally thickens to two and a half and three feet, but will not average more than two. This bed appears to be the one which outcrops in the mountain along the line of the Cincinnati Southern Railroad from near Keathley, at Big Emory Gap, to Oakdale and a number of miles beyond. As seen along this line the coal is variable in thickness and quality. It swells out in places to three and four feet. At points it is good cubic coal, but at other points it contains much pyrites. In places, especially above Oakdale, the bed has been much disturbed.

In the belt of the country, starting from Lancing on the Cincinnati Southern Railroad and extending through the Wartburg and Crooked Fork regions on to De Armond's or Little Emory Gap, banks and exposures of good coal are met with, some belonging to the great seam at Coal Creek, many four feet thick, and enough of them to give assurance of the existence here of a field, rich in first-class bituminous coals, and lying in heavy, wide-spreading beds.

We pass now to the southwest side of Emory River and present one example of what may be expected of the third series in that section. From Deermont, present headquarters of the company, and an attractive place, on the very edge of the mountain, 700 feet above the river and the railroad, both of which it overlooks, our party traveled a little west of south three miles or thereabouts to a region of very promising coal. Two openings were seen. The coal in the first was once worked for blacksmiths' purposes. The opening, a mere outcrop on the slope of a hill, showed twenty-eight inches of clean, horizontal coal with thick shales above and fire clay below.

The second opening is at a point about half a mile over a ridge nearly south of the first. It is an open cut at the edge of the valley. The coal here has only a covering of earth, yet it has so far resisted weathering agencies as to show a thickness of forty-two inches. It is doubtless the same as that of the first opening, the bed extending continuously under the whole ridge. The bed to which these coals belong can hardly be less than from four to five feet in thickness. The character of the superficial exposures at the two openings fully justifies this statement.

The country in which this coal lies is remarkably well adapted to mining purposes. It is a plateau-like country intersected by numerous valleys. The coal outcrops on the slopes of the ridges or near their bases. The strata are horizontal and undisturbed. The coal is thus made accessible and mining made easy. Considering the character of the coal in connection with its local accessibility the region, as a mining district, hardly has an equal. What it lacks is an outlet, but this can be provided.

Below are two analyses of this coal, made by Messrs. Guild & White. 1 is that of a sample from the first opening, and 2 a sample from the second.

COAL.	1	2
Hyg. moisture	3.29	5.75
Volatile matter	22 79	25.50
Fixed Carbon	70.53	66.23
Ash	3.39	2.52
	100.00	100.00
Sulphur (det. sep.)	1.302	1.351
COKE.		
Fixed Carbon	95.42	96.33
Ash	4.58	3.67
	100.00	100.00
Sulphur (sep. det.)	1.040	1.728

The high percentages of fixed carbon and the low ash are to be noted.

This completes the part of my report on your coal lands. The object has been to make such an analysis of the Tennessee Coal Measures, and especially of that part in which you are personally interested, as would give you a fair, and so far as possible under the circumstances, a satisfactory idea of the great wealth of coal buried in your property. You will see that much remains to be done in the way of exploration. I trust, however, and believe that enough has been presented to assure you, that, so far as the quantity and quality of the stone coal are concerned, your expectations have been fully met. Each of the three series, it has been seen, contains known workable coal beds, and in addition, other horizons in which we have a right to expect that beds will be found. The aggregate of known coal is very great. Over large areas the beds are horizontal or nearly so, above water level, and well situated for economical mining. The coals of Walden's Ridge are inclined or vertical, but above the streams and successfully handled. The beds below water level can be reached by the methods of deep mining in practice in all coal-bearing countries.

IRON ORE.

The iron ore found upon your property is a red or brown stratified rock. It is known as Clinton ore, and sometimes, on account of its use for coloring purposes, as dyestone. It is a very persistent formation reaching from New York State to Alabama. It is used in furnaces in all the States through which it passes. It occurs in especially thick masses in Alabama, where it is the main dependence for many furnaces.

The relation of the formation which holds it, the Clinton, to the other formations may be learned by reference to sections I and II and the table on page 57.

It is there seen that the Clinton and its ore lie next under the Carboniferous limestone, and that they come out from under the mountain, being, at the same time elevated and upturned as other formations. Owing to this upturning, a line of outcrop of the ore is always to be looked for running along the base of Walden's Ridge and parallel with it. Other lines of outcrop are found often at considerable distance in the great Valley away from the Ridge, a result of the general folding and faulting of the strata. The ore outcropping along the base of Walden's Ridge necessarily runs deeply beneath the mountain.

The lines of outcrop on your property are as follows:

1st. A double line, two seams, extending along the foot or base of Walden's Ridge through your lands for ten miles. The thicknesses vary from one to two feet, solid ore, rarely reaching two and a half or three.

2d. Two double lines of ore, four in all, in the ridges, from one and a half to two miles in front of Little Emory Gap. One of the double lines extends southwesterly towards Big Emory Station, crosses the river and cutting diagonally through the railroad tunnel, approaches Walden's Ridge leaving the Station to the left. These aggregate many miles in length. In places the seams are multiplied above the normal number. They vary in thickness like those along the base of Walden's Ridge.

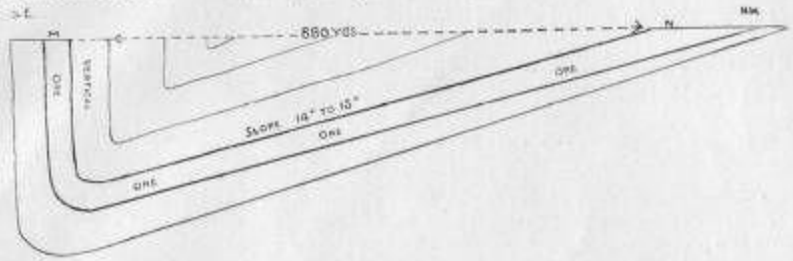
3d. The invaluable belt of iron ore in Roane County, south of Kingston and on the south side of the Tennessee river. This is in a ridge which commences at the river and extends like its neighboring and parallel ridges indefinitely to the southwest.

The lines of ore enumerated under 1 and 2 are of the kind upon which many furnaces in Tennessee in part or wholly depend. Those running along Walden's Ridge are continuous with those of Rockwood. Near the surface the outcrops of the seams generally supply soft

ore. Descending upon them, however, the ore often becomes more calcareous and consequently harder. They are valuable property, and their ores in demand,

But far more important is the great bed south of Kingston and the Tennessee river. This is a mammoth bed of iron ore, the largest and best that has come under my observation in Tennessee. There are at present three principal points where ore is obtained, the Round Island mine, the Hackler's Gap mine, and the Eureka, all of which were visited by our party.

Hackler's Gap and Eureka give characteristic sections. In both the ore bed lies in a trough, the cross-section of which may be represented by the following figure:



The sloping part is on the northwest side. The trough extends longitudinally northeast and southwest with the course of the ridge. At Hackler's Gap, mining is done in the sloping part, the vertical portion not having been uncovered.

In the gap at Eureka, both sides of the trough are mined. The ore at Hackler's Gap averages about seven feet in thickness, ranging from five and one-half to nine. The bed contains one or two thin layers of shale, but these are not included in the measurement above. At Eureka the ore has nearly the same thickness, in fact, the ore at all points visited is much the same in this respect.

The ore is of two kinds, the soft and the hard. Where the bed has been most subjected to weathering influences it has lost more or less of its calcareous constituent and become soft. The vertical ore of Eureka is of the soft kind. The analyses below will give the differences in the composition of the two varieties.

The ore in this ridge lies in a fold said to be nine miles long. It is canoe-like, in that the ends rise up to the summit of the ridge and run out. The Round Island mine is near the northeast end of the canoe.

It is estimated that in the Eureka and Hacker's gap portions it is half a mile directly across the fold, from the outcropping edge of one side to that of the other (from *m* to *n* in the diagram.) This would give, assuming the sloping side to fall at the rate of 14° to 15°, as was observed at Hackler's Gap, and supposing the fold to be flattened out, a stratum of ore about 880 yards wide. Such a stratum one mile long would contain 1,983,000 cubic yards, and putting the thickness of the bed at six feet this would be doubled, giving 3,966,000 to the mile. Your Company own, I am informed, five miles of the range. On the basis above, and allowing one mile for breaks and gaps in the ridge and for diminished width at the Round Island mine or river end, the red ore held by you in fee simple in this famous ridge reaches the grand total of 15,864,000 cubic yards of solid, available ore. If estimated by weight it would not be far from 42,800,000 long tons, representing an enormous money value.

It may be that the distance from outcrop to outcrop across the fold as given above is too great, and that the average would be less, say half as much, or one-fourth of a mile, still the result remains exceedingly great, a supply for an indefinite time.

These ores have been practically tested in tunnels, in open workings, and at various points. Many thousands of tons are shipped and have been shipped to furnaces at Rockwood, Dayton, Chattanooga and South Pittsburg. They contain too much phosphorus for making steel by Bessemer processes. But outside of this, the demand for foundry pig is great enough to keep alive and active the very many furnaces which rely on this ore in Tennessee, Georgia and Alabama. But yet we look forward to an early day when basic methods will make this a steel ore as well, a consummation that will enhance an interest already gigantic.

In the above account of your iron ores the purpose has been to illustrate the mode of occurrence and the quantity of the ore. Notices of what has been done in the way of mining and the discussion of mining methods and matters especially connected therewith have been left to others.

Your main dependence for ore must be the great bed we have just described. The small seams near and running parallel with Walden's Ridge, and aggregating more than twenty miles

in length, are a great storehouse of ore, but they are comparatively thin and often vertical or nearly so in position, and when deeply mined sometimes calcerous and hard. They need to be supplemented by such softer ores as your great deposit yields. Together they will work out the best results.

With such coal and iron ore and limestone as you control; with unbounded forest lands, and wide stretches of cultivated areas as well, through which flow waters of great excellence; with a grand trunk railroad and branches of others intersecting your property; and withal, an elevated, healthful country, what more can you ask in which to build up thrifty, busy communities and industrial centers, where the embellishments shall be furnaces, coke ovens, smoke stacks, rolling mills, school houses, churches and happy homes?

Respectfully submitted,

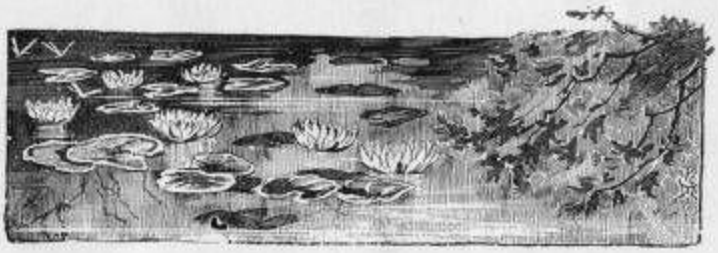
JAMES M. SAFFORD,
State Geologist of Tennessee, and Professor of Geology in Vanderbilt University.

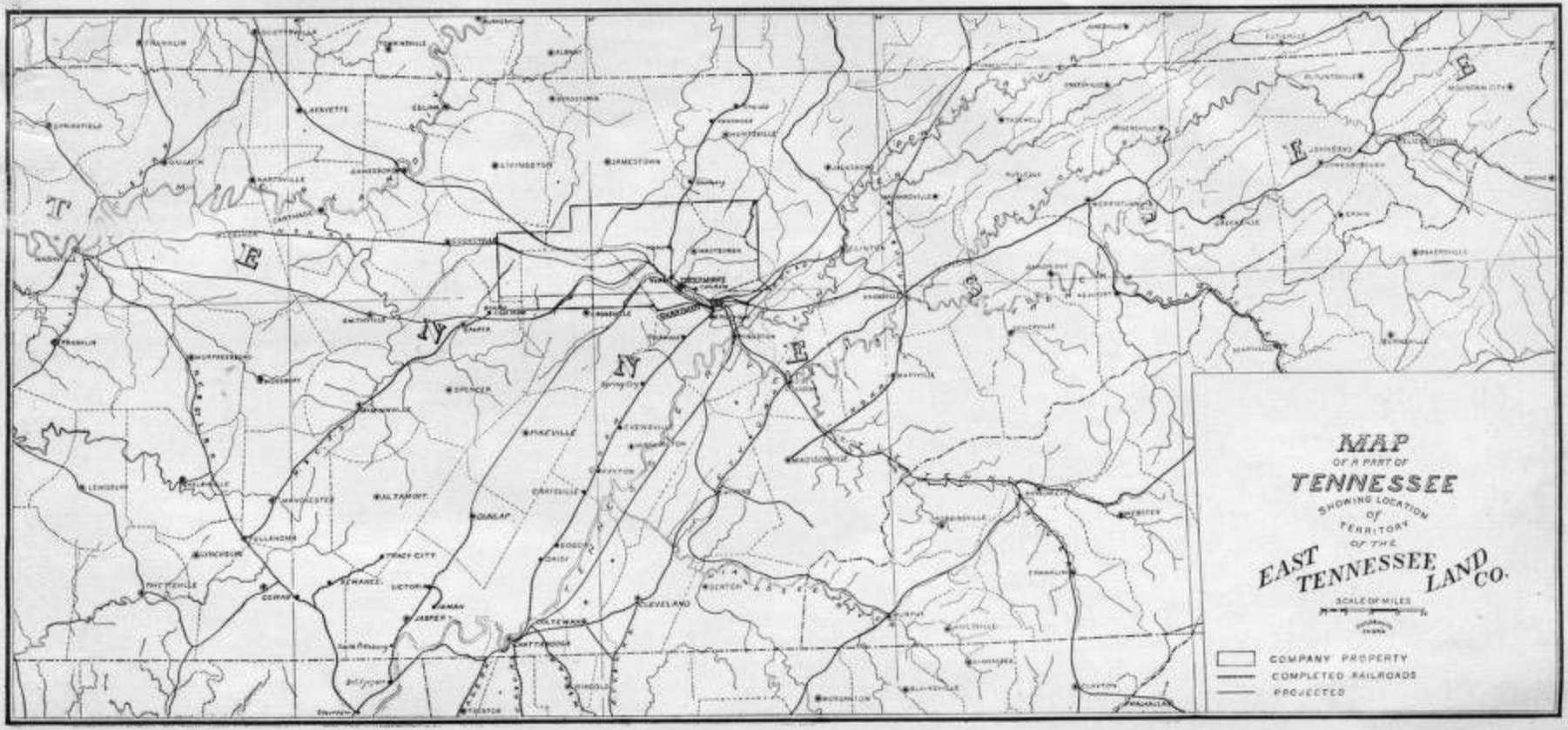
NASHVILLE, TENN., Nov. 13, 1889.

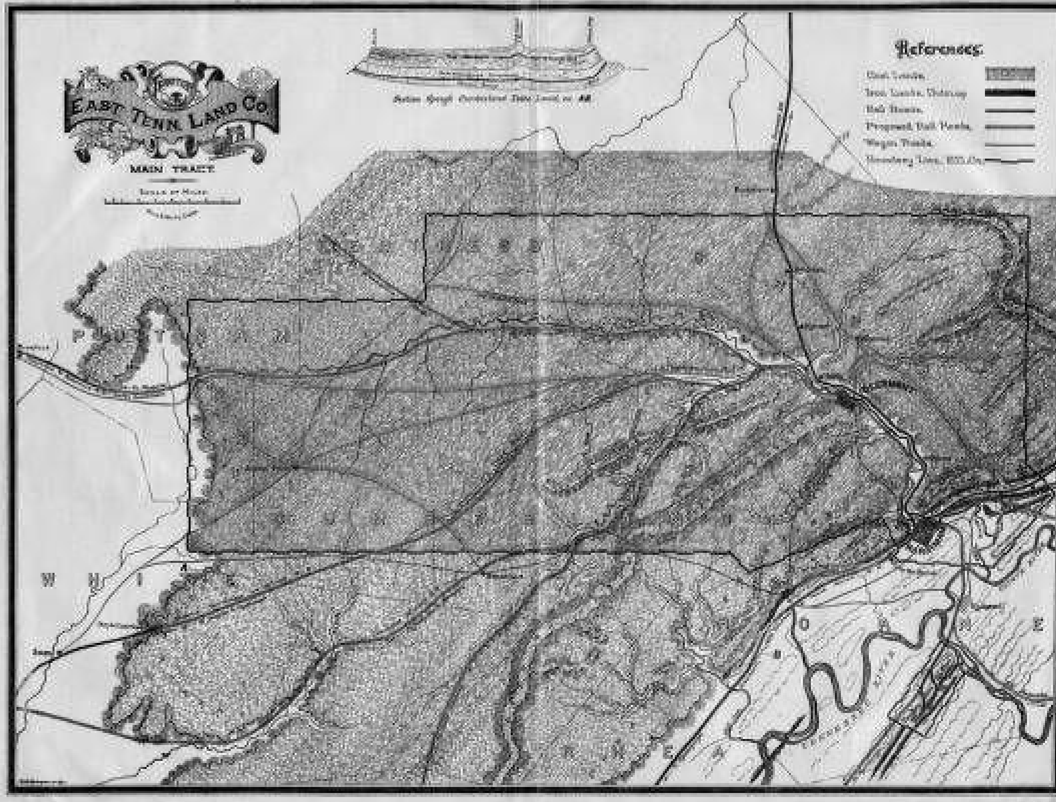
The following are analyses of red ores made by Messrs. Guild and White of Chattanooga:

1. Red Fossil Iron Ore, Eureka Vertical Vein, Upper Level, Foot.
2. Fossil Ore, Eureka Vertical Vein, Lower Level, Foot.
3. Fossil Ore, Eureka Vertical Vein, Lower Level, Top.
4. Fossil Ore, Hackler's Gap, Top of Incline.
5. Hard Fossil Ore, Hackler's Gap, Top of Incline.
6. Hard Fossil Ore, Hackler's Gap, Northeast Works.
7. Fossil Ore, Hackler's Gap, Northeast Works, Average across the Vein.
8. Fossil Ore, Vertical Vein, at Little Emory Gap.

	1	2	3	4	5	6	7	6
Iron	50.07	50.64	52.75	51.16	27 20	44.12	51.32	59.34
Silica	11.13	15.86	9.25	11.56	5.54	6.82	12.17	11.22
Phosphorus	.481	.462	.550	.493	.400	.404	.520	.197
Calcium Carbonate								
Alumina								




MAP
OF A PART OF
TENNESSEE
SHOWING LOCATION
OF
TERRITORY
OF THE
EAST TENNESSEE LAND CO.
SCALE OF MILES
COMPANY PROPERTY
COMPLETED RAILROADS
PROJECTED
CHATTANOOGA
CLEVELAND
KNOXVILLE
NASHVILLE


East Tenn. Land Co.
Main Tract
References:
Proposed Rail Roads
Wagon Roads